Bang&Olufsen

Beovision LX 5000/6000

Type 42xx

Beovision MX 4000/6000

Type 35xx

Accessories

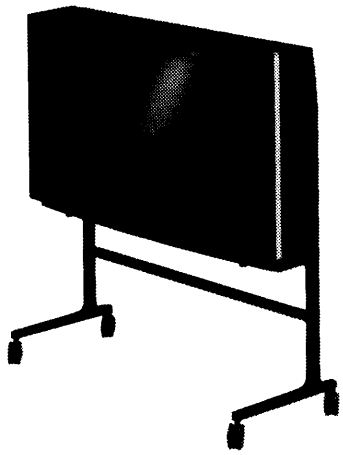
Nicam
Picture-in-Picture
Transposer

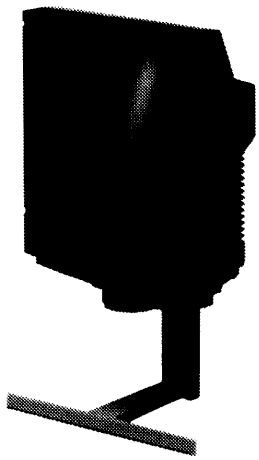
Stands LX

TB 4108
ST 4117
MS 4106
MB 4101

Stands MX

TB 4110
ST 4109
MS 4107
MS 4116
MB 4102
MB 4105
WB 4114





SERVICEANVISNING
SERVICE MANUAL

INDHOLDSFORTEGNELSE

Oversigt over moduler 1-1
Tekniske specifikationer 1-2

Diagrammer m.m. **2**
Diagramforklaring 2-1
Ledningsdiagram 2–2
Diagrammer ..... 2-3 – 2-18
Blokdiagrammer ..... 2-19 – 2-24
Tilbehør ..... 2-25 – 2-30

Elektrisk stykliste **3**

Mekanisk stykliste **4**

Justeringer **5**

Adskillelse **6**

Reparationstips **7**
Service mode 7-1
Fejlfinding i AFC kredsløb 7-3
Fejlfinding i switch mode power supply 7-4
Retningslinier til fejlfinding i horisontal afbøjning 7-6
Automatisk Cut-Off 7-7
Options & shift funktioner 7-8

Isolationstest **8**

Kredsløbsbeskrivelse **9**

CONTENTS

Survey of modules 1-1
Technical specifications 1-2

Diagrams etc. **2**
Explanation of diagram 2-1
Wiring diagram 2-2
Diagrams ..... 2-3 – 2-18
Block diagrams ..... 2-19 – 2-24
Accessories ..... 2-25 – 2-30

List of electrical parts **3**

List of mechanical parts **4**

Adjustments **5**

Disassembly **6**

Repair tips **7**
Service mode 7-1
Fault-finding in AFC circuits 7-3
Fault-finding in switch mode power supply 7-4
Guidelines for fault-finding in the horizontal deflection 7-6
Automatic Cut-Off 7-7
Options & shift functions 7-8

Insulation test **8**

Circuit description **9**

Bang&Olufsen

3 Video Output .....diagram C-I page 2-7, 15

4 Power Supply & Deflection .....diagram I page 2-15

6 Microcomputer 64K .....diagram F-G page 2-10, 11

7 Headphone .....diagram C page 2-7

8 Nicam .....diagram J page 2-16

9 IR Transceiver .....diagram F page 2-10

10 Sound Output .....diagram C page 2-7

12 Pal Decoder .....diagram B page 2-5

13 Sync Processing .....diagram H page 2-14

14 Double AV Switch .....diagram D-E page 2-8, 9

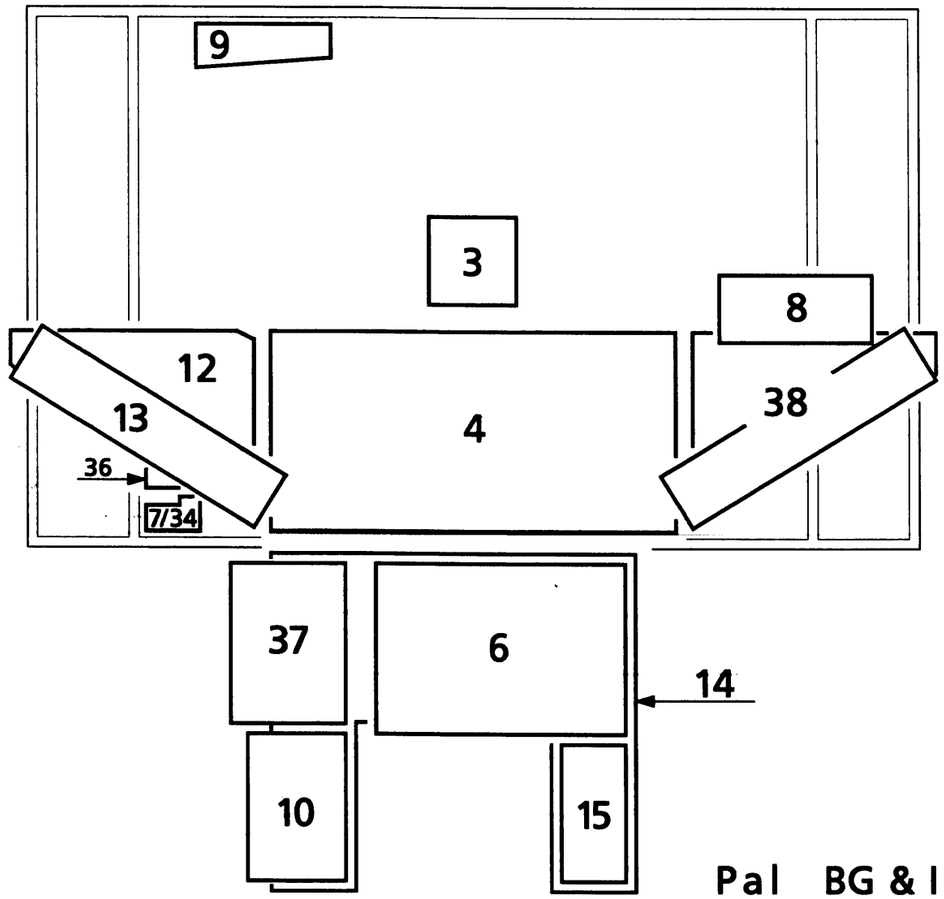
15 St By Stabilization .....diagram C-F-G page 2-7, 10, 11

34 Headphone MX4000 .....diagram C page 2-7

36 Deflection Transformer .....diagram C-I page 2-7, 15

37 Teletext .....diagram H page 2-14

38 Tuner & IF B/G & I .....diagram A page 2-4



Pal BG & I

1-1

1 Tuner & IF B/G/L ..... diagram A page 2-3

2 Pal/Secam Decoder .....diagram B page 2-6

3 Video Output .....diagram C-I page 2-7, 15

4 Power Supply & Deflection .....diagram I page 2-15

6 Microcomputer 64K .....diagram F-G page 2-10, 11

7 Headphone .....diagram C page 2-7

8 Nicam ..... diagram J page 2-16

9 IR Transceiver .....diagram F page 2-10

10 Sound Output .....diagram C page 2-7

13 Sync Processing .....diagram H page 2-14

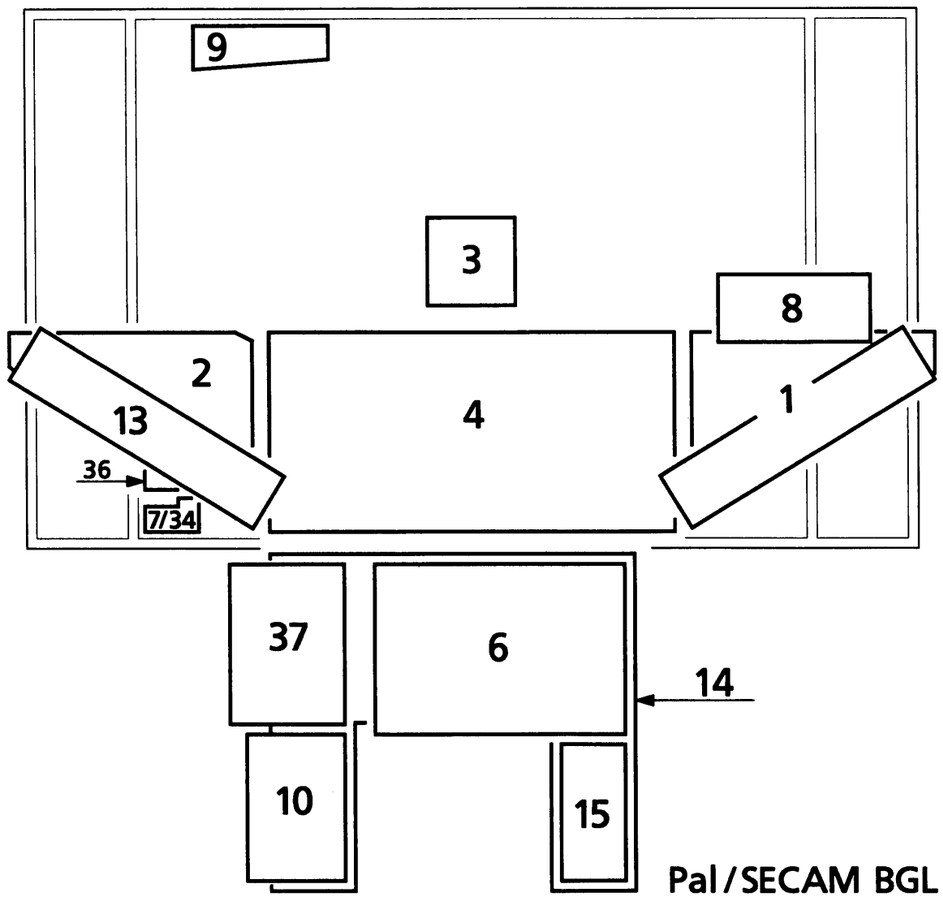
14 Double AV Switch .....diagram D-E page 2-8, 9

15 St By Stabilization .....diagram C-F-G page 2-7, 10, 11

34 Headphone MX4000 .....diagram C page 2-7

36 Deflection Transformer .....diagram C-I page 2-7, 15

37 Teletext .....diagram H page 2-14



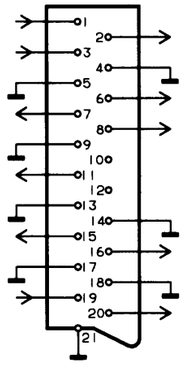
Pal/SECAM BGL

1-2

TECHNICAL SPECIFICATIONS	Beovision MX4000-MX6000-LX5000-LX6000
CTV system	*
Picture tube (Visual picture)	LX5000 63 cm – 25" (59 cm – 23")
	LX6000 70 cm – 28" (66 cm – 26")
	MX4000 55 cm – 21" (51 cm – 20")
	MX6000 70 cm – 28" (66 cm – 26")
Picture tube system	Flat square, HI-Bri, In-Line 110 degrees
Cabinets	LX: Rosewood – White – Grey Metallic
	MX: Red – White – Black – Blue – Grey
Operation	Beolink 1000, one-way
	Beolink 5000, two-way
	Beolink 7000, two-way
TV tuner range	46-855 MHz: VHF, S, Hyper, UHF channels
	*(System I 470-855 MHz: UHF channels)
No. of TV programmes	59 (+5 for local rooms)
Station identification	Station naming/program list
Satellite	*Prepared for Beosat LM
No. of satellite programmes	99
Signal/noise level	>35 dB/1Vpp and antenna signal >1 mV
Crosstalk between sources	>45 dB/5 MHz
Teletext	FLOF, 6-alphabet
Teletext memory	4 x 59 page nos.
Sound system	*Nicam + A2 stereo decoder + A2 dual language
Speaker system	2 x Bass reflex, (MX 4000 2 x Log Line)
Long-term max. output power	2 x 40 watts/8 ohms
Harmonic distortion	<0.5% at 15 watts
Intermodulation	<1%
Signal/noise ratio	>50 dB weighted 50 mW (Nicam >70 dB)
Frequency range	25-20,000 Hz ±1.5 dB
Power bandwidth	25-20,000 Hz
Channel separation	A2 stereo >26 (Nicam >50 dB)
Bass control	±8 dB/100 Hz
Treble control	±8 dB/10,000 Hz
Crossover frequency	2500 Hz
Other data	
Mains voltage	220V-240 volts, 50-60 Hz
Power consumption	100 (75-165) watts
Power consumption Stand-by	3 watts
Dimensions W x H x D/Weight	LX5000 78 x 47 x 42 cm/36.5 kg
	LX6000 86 x 52 x 46 cm/43 kg
	MX4000 51 x 55 x 41.5 cm/23 kg
	MX6000 65 x 67.5 x 46.5 cm/40.3 kg

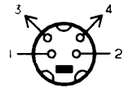
1-2

AV1 & AV2



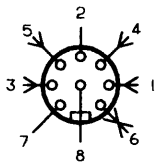
Pin 1	Audio R out 1V RMS 820 ohms
Pin 2	Audio R in 1V RMS 47 kohms
Pin 3	Audio L out 1V RMS 820 ohms
Pin 4	Audio ⊥
Pin 5	Blue ⊥
Pin 6	Audio L in 1V RMS 47 kohms
Pin 7	Blue in 0.7Vpp 75 ohms
Pin 8	12V sense Logic 0 = 0V-2V 10 kohms Logic 1 = 9.5V-12V 10 kohms Data High: Logic 0 = 9.5V-10.3V Logic 1 = 11V-12V Low: Logic 0 = 0V-0.55V Logic 1 = 1.25V-2V
Pin 9	Green ⊥
Pin 10	Not used
Pin 11	Green in 0.7 Vpp 75 ohms
Pin 12	Not used
Pin 13	Red ⊥
Pin 14	Blanking ⊥
Pin 15	Red in 0.7 Vpp 75 ohms
Pin 16	Blanking in Logic 0=0 to 0.4V Logic 1=1 to 3V R in 75 ohms
Pin 17	Video out ⊥
Pin 18	Video in ⊥
Pin 19	Composite video out 1Vpp 75 ohms (Y-insert only AV1)
Pin 20	Composite video in 1Vpp 75 ohms
Pin 21	Shield

S-VHS



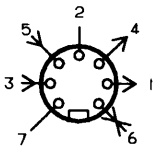
Pin 1	Y ⊥
Pin 2	C ⊥
Pin 3	Luminance in (Y) 1Vpp 75 ohms
Pin 4	Chrominance in (C) 75 ohms

POWER LINK 1&2



Pin 1	PL ON = >2.5V, OFF = <0.5V
Pin 2	Signal ⊥
Pin 3	AF out left max. 1V RMS
Pin 4	PL Speaker ON = >2.5 V, OFF = <0.5V
Pin 5	AF out right max. 1V RMS
Pin 6	Data: High >3.5V, Low <0.8V
Pin 7	⊥
Pin 8	Not used

AUDIO AUX LINK



Pin 1	AF in left 0.25 - 2V RMS 47 kohms
Pin 2	Signal ⊥
Pin 3	AF out left 1V RMS 1 kohms
Pin 4	AF in right 0.25-2V RMS 47 kohms
Pin 5	AF out right 1V RMS 1 kohms
Pin 6	Data: High >3.5V, Low <0.8V
Pin 7	Not used

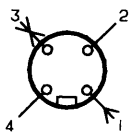
EXTERNAL SPEAKERS L&R

>8 ohms passive speakers

HEADPHONE

ø3.5 mm 220 ohms in series
to the output amplifier.
The internal and external
speakers are switched off
when the headphone is connected.

B&O STAND



Pin 1	Supply out 12.5V-15V max. 350 mA
Pin 2	Supply ⊥
Pin 3	Data
Pin 4	Data ⊥

Accessories	
Nicam module	8930480 system B/G
	8930490 system I
Beosat LM installation kit	1300200 (with sw version 3.0 or higher)
Positioner module	1301200
Power positioner module	8729020
NTSC system M module	*8007997
Picture-in-picture module	1412200 (LX models)
	1412300 (MX models)
Transposer	*1306125 white
	*1306126 black
Sound extension kit:	
Pal I sound kit for B/G/L	*3390452
East D/K sound kit for B/G/L	*3390453
Stands LX5000 – LX6000	
Table: TB 4108	1410865, white
	1410866, black
Traverse: LX6000 – TR 4103	1410365, white
	1410366, black
LX5000 – TR 4104	1410465, white
	1410466, black
Shelf: LX6000 – SH 4111	1411113, metal grey
LX5000 – SH 4112	1411213, metal grey
Stand: ST 4117	1411766, black
	1411769, silver grey
Shelf: SH 4113	1411366, black
Motorized stand: MS 4106	1410666, black
	1410669, silver grey
Shelf: SH 4113	1411366, black
Motorized base: MB 4101	1410111, aluminium
Stands MX4000 – MX6000	
Table MX4000 – TB 4110	1411066, black
	1411069, silver grey
Shelf: VX – SH 4113	1411366, black
Stand MX6000 – ST 4109	1410966, black
	1410969, silver grey
Shelf: VX - SH 4113	1411366, black
Motorized stand MX6000 – MS 4107	1410766, black
	1410769, silver grey
MX4000 – MS 4116	1411666, black
	1411669, silver grey
Shelf: VX – SH 4113	1411366, black
Motorized base MX6000 – MB 4102	1410211, aluminium
MX4000 – MB 4105	1410511, aluminium
Wall bracket MX4000 – WB 4114	1411466, black

*TYPE SURVEY								Mounting modules for modification to other TV transmission systems						
LX6000	LX5000	MX6000	MX4000	System	Colour	Remarks		PAL B/G/I	PAL/SECAM B/G/L/I[1)]	PAL/SECAM B/G/D/K	PAL B/G	PAL/SECAM B/G	PAL/SECAM B/G/L[1)]	PAL/SECAM B/G NTSC M
4200	4220	3500	3520	B/G/L[1)]	PAL/SECAM	A2	EU		3390452	3390453				8007997
4201	4221	3501	3521	B/G/L[1)]	PAL/SECAM	A2+NICAM[2)]	EU		3390452	3390453				8007997
4202	4222	3502	3522	I	PAL		GB	3390452 +8007449	3390452 +8007449 +8007629	3390453 +8007449 +8007629	8007769	8007769 +8007629	8007449 +8007629	8007997 +8007629
4203	4223	3503	3523	I	PAL	NICAM[2)]	GB	3390452 +8007449	3390452 +8007449 +8007629	3390453 +8007449 +8007629	8007769	8007769 +8007629	8007449 +8007629	8007997 +8007629
4204	4224	3504	3524	B/G/L[1)]	PAL/SECAM	A2	Italy		3390452	3390453				8007997
4205	4225	3505	3525	B/G	PAL	A2	AUS	3390452 +8007449	3390452 +8007449 +8007629	3390453 +8007449 +8007629		8007629	8007449 +8007629	8007997 +8007629
4206	4226	3506	3526	B/G	PAL	A2	EU	3390452 +8007449	3390452 +8007449 +8007629	3390453 +8007449 +8007629		8007629	8007449 +8007629	8007997 +8007629
4207	4227	3507	3527	B/G	PAL	A2+NICAM[2)]	EU	3390452 +8007449	3390452 +8007449 +8007629	3390453 +8007449 +8007629		8007629	8007449 +8007629	8007997 +8007629
4240	4270	3540	3570	B/G/L[1)]	PAL/SECAM	A2	EU		3390452	3390453				8007997
4243	4273	3543	3573	B/G/L[1)]	PAL/SECAM	A2+NICAM[2)]	EU		3390452	3390453				8007997
4245	4275	3545	3575	B/G/L[1)]	PAL/SECAM	A2+NICAM[2)]	EU		3390452	3390453				8007997
4246	4276	3546	3576	I	PAL		GB	3390452 +8007449	3390452 +8007449 +8007629	3390453 +8007449 +8007629	8007769	8007769 +8007629	8007449 +8007629	8007997 +8007629
4249	4279	3549	3579	I	PAL	NICAM[2)]	GB	3390452 +8007449	3390452 +8007449 +8007629	3390453 +8007449 +8007629	8007769	8007769 +8007629	8007449 +8007629	8007997 +8007629
4252	4282	3552	3582	B/G/L[1)]	PAL/SECAM	A2	Italy		3390452	3390453				8007997
4257	4287	3557	3587	B/G	PAL	A2	EU	3390452 +8007449	3390452 +8007449 +8007629	3390453 +8007449 +8007629		8007629	8007449 +8007629	8007997 +8007629
4258	4288	3558	3588	B/G	PAL	A2+NICAM[2)]	EU	3390452 +8007449	3390452 +8007449 +8007629	3390453 +8007449 +8007629		8007629	8007449 +8007629	8007997 +8007629

[1)]System L: To receive VHF band 1 system L, the TV has to be fitted with a transposer part no. 1306125 (white) 1306126 (black).

[2)]It is not possible to receive NICAM system B/G and NICAM system I with the same type.
NICAM PCB: NICAM system B/G no. 8930480. NICAM system I no. 8930490.

8007449 Tuner & IF system B/G/L PCB.
3390452 Small bag with components to extend 8007449 to system I.
3390453 Small bag with components to modify 8007449 to system B/G/D/K.
8007629 PAL/SECAM/NTSC colour decoder PCB. TV's equiped with 8007629 (PAL/SECAM MODELS) are able to receive NTSC on AV.
8007997 Tuner & IF system B/G/M PCB.
8007769 Tuner & IF system B/G PCB.

2-1

DIAGRAMFORKLARING

På diagrammerne er der angivet typenumre på transistorer og IC'er. Hvis positionsnummeret er efterfulgt af en stjerne, skal reservedelsnummeret altid benyttes, da denne komponent er specielt udvalgt, f.eks. TR102*.

Komponenttryk og koordinatsystem

De største printplader er forsynet med komponenttryk og et koordinatsystem på både print- og komponentside.
På diagrammerne er enhver komponent forsynet med et koordinatnummer. Dette fortæller i hvilket koordinat på printpladen, komponenten er placeret. Koordinatnumrene er angivet med mindre skrifttype end positionsnumrene.

Styrekredsløb

I visse styrekredsløb er den aktive tilstand angivet med en funktions- eller bogstavsangivelse. Denne kan eksempelvis være $\overline{\text{ST.BY.}}$ = »low« i stand-by-stilling eller ST.BY. = »high« i stand-by-stilling.

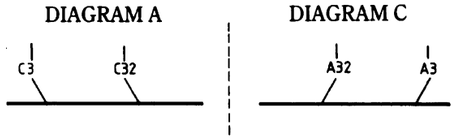
Ledningsforbindelser

Ledningsforbindelserne på diagrammerne er samlet i »bundter«. De enkelte ledninger er forsynet med en af følgende koder:

INTERN FORBINDELSE PÅ EN DIAGRAMSIDE

Interne forbindelser på en diagramside angives med et tal. Knækket på ledningen viser, i hvilken retning, den anden ende af ledningen findes.

FORBINDELSE TIL EN ANDEN DIAGRAMSIDE



Forbindelsen til en anden diagramside angives med et tal samt et bogstav for det diagram, forbindelsen går til.

EXPLANATION OF DIAGRAM

Type numbers of transistors and ICs are indicated on the diagrams.
If the position number is followed by an asterisk the spare part number must always be used because the component in question has been specially selected, e.g. TR102*.

Component print and coordinate system

The largest PCBs have component prints and a coordinate system on both the print and the component side.
On the diagrams every component has a coordinate number. This indicates in which coordinate on the PCB the component is situated. The coordinate numbers are written in smaller print types than the position numbers.

Control Circuit

In certain control circuits the active mode is indicated by a function term or by an abbreviation. This may be e.g. $\overline{\text{ST.BY.}}$ = low in the stand-by mode or ST.BY. = high in the stand-by mode.

Wiring Connections

The wiring connections on the diagrams are assembled in 'bundles'. The individual wires are provided with one of the following codes:

INTERNAL CONNECTION ON ONE DIAGRAM PAGE

Internal connections on a diagram page are indicated by a number. The bend of the wire indicates in which direction the other end of the wire is found.

CONNECTION TO ANOTHER DIAGRAM PAGE

A connection to another diagram page is indicated by a number as well as by a letter of the diagram to which the connection leads.

Stelsymboler

Der anvendes tre forskellige stelsymboler i diagrammerne som vist:

= Stel der ikke er galvanisk adskilt fra lysnettet (anvendes på diagram I, PCB4).

= Stel

= Signalstel

Signalveje og markering på IC'erne

Signalvejene er vist på diagrammerne ved hjælp af kraftigere optrukne streger og pile. Der anvendes tre forskellige typer pile som vist:

= Video, luminans og chrominans signalerne

= Lydsignal

= Øvrige signaler

Pilene der er vist på benene af IC'erne, fortæller om det pågældende ben er en ind- eller udgang.

MÅLEBETINGELSER

Alle DC spændinger er målt i forhold til stel og med voltmeter eller oscilloskop med en indre modstand på mindst 2 Mohm.

DC spændinger og oscilloskopbilleder er målt i TV mode ved et UHF antennesignal (farvebar) på ca. 1,5 mV. Lys step 32, kontrast step 44 og farvemætning step 32.

SYMBOL FOR SIKKERHEDSMODSTANDE

Ved udskiftning af komponenter med dette symbol skal der anvendes samme type, samt samme værdier for ohm og watt. Den nye komponent skal monteres på samme måde som den udskiftede.

Ground symbols

Three different ground symbols are used in the diagrams:

= Ground that is not galvanically separated from the mains.
(Used in diagram I, PCB4).

= Ground

= Signal ground

Signal paths and IC markings

The signal paths are shown in the diagrams by means of semibold lines and arrow heads. As shown, three different types of arrow head are used:

= Video, luminance and chrominance signals

= Sound signal

= Other signals

The arrow heads shown in the IC pins tell whether the pin indicated is an input or an output.

MEASURING CONDITIONS

Measure all DC voltages in relation to ground and with voltmeter or oscilloscope with inner resistance of at least 2 Mohm.

Measure DC voltages and oscilloscope pictures in TV mode at an UHF aerial signal (colour bar) of approx. 1.5 mV. Brilliance step 32, contrast step 44 and colour saturation step 32.

SYMBOL FOR SAFETY RESISTORS

When replacing components with this symbol the same type has to be used, also the same values for ohm and watt. The new component is to be mounted in the same way as the replaced one.

WIRING DIAGRAM

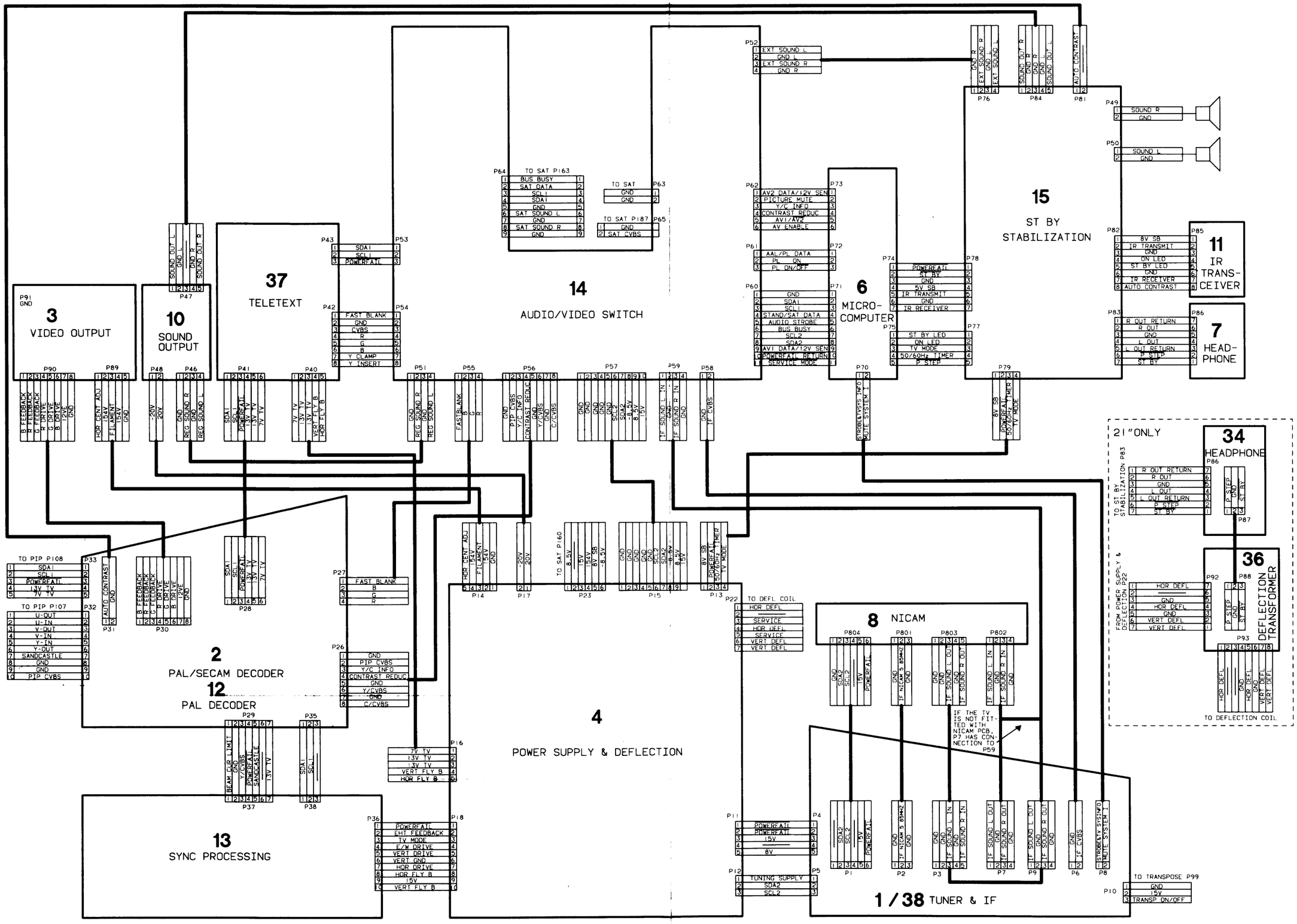


DIAGRAM A TUNER & IF SYSTEM B/G/L

TUNER & IF SYSTEM B/G/L

VIDEO & SOUND IF

IF NICAM

SOUND SECTION

IC3 TDA8120

BUFFER

LIMITER AND PHASE SHIFTER (90°)

SIF DEMODULATOR

SIF AMP (3 STAGES)

AGC AMP AND AGC DELAY

AM OR AGC DETECTOR

LIMITER

SSW

STANDARD SWITCH (B/G OR L)

VOLT REG

TOP SYNC CLAMP TOP WHITE CLAMP MIN. VIDEO DETECTOR

VIF AMP (3 STAGES)

VIDEO DEMOD. AND BUFFER

WHITE SPOT INVERTER

NOISE INVERTER

VIDEO PREAMP.

VIDEO SECTION

PHASE SHIFTER (0° OR 180°)

AGC TAKE OVER

POWER SUPPLY

POWERFAIL

TUNING SUPPLY

TUNER AGC

SYS L

SYS BG

AM SOUND SYS L

VIDEO LEVEL

IC13 4052

DEMODULATOR

IC9 LM358N

AFC UNDER

AFC OVER

AFC OUT

IC6 PCF8574P

I/O PORTS

I²C BUS CONTR

STOP TUN

VIDEO IDENT

VIDEO POLARITY

TRANSPOSE ON/OFF

IC4 TDA8124

DEMOD

COMP

POLARITY IDENT

FLIP FLOP

SIGNAL IDENT

CVBS

IC12 NE 567

PHASE DETECTOR

CURRENT CONTROLLED OSCILLATOR

QUADRATURE PHASE DETECTOR

REF FREQ

V REF

IC5 4094 SER/PAR REG

CLP

DATA

STR

BG/L

BG/L

STROBE & TV SYSTEM INFO

IC1 TDA9820 FM SOUND DEMODULATOR

7 STAGE LIMITER-AMPLIFIER

TV SYSTEM CONTROL

VCO1

VCO2

MUTE

SUPPLY

IC2 TDA 8417

DEEMPHASIS AND DEMATRIX

AF SWITCH

SOURCE SELECTOR

STEREO

DUAL

LOGIC

54.7kHz

117Hz

274Hz

FREQ DIVID

POWER-ON RESET

OSC

SUPPLY

I²C-BUS TRANSCEIVER

CH SEP

IF SOUND LEFT

IF SOUND RIGHT

SDA2

SCL2

PRESET

TO TRANSPOSER

■ IF THE TV IS NOT FITTED WITH NICAM PCB, P7 HAS CONNECTION TO P59 ON THE VIDEO & SOUND SWITCHING PCB

DIAGRAM A TUNER & IF SYSTEM B/G & I

38 TUNER & IF SYSTEM B/G & I

VIDEO & SOUND IF

IC3 3C TDA8120 SOUND SECTION

BUFFER

LIMITER AND PHASE SHIFTER (90°)

SIF AMP (3 STAGES)

SIF DEMODULATOR

AGC AMP AND AGC DELAY

AM OR AGC DETECTOR

LIMITER

SSW

STANDARD SWITCH (B/G OR L)

VOLT REG

TOP SYNC CLAMP TOP WHITE CLAMP MIN VIDEO DETECTOR

VIF AMP (3 STAGES)

VIDEO DEMOD AND BUFFER

WHITE SPOT INVERTER

NOISE INVERTER

VIDEO PREAMP.

PHASE SHIFTER (0° OR 180°)

VIDEO SECTION

AGC TAKE OVER

TUNER AGC

TUNING SUPPLY

POWER SUPPLY

POWERFAIL

IC7 78M05

TU1

SW2

R1 & R2 ARE SHORT CIRCUIT IN SYSTEM B/G

C1 & C2 ARE NOT MOUNTED IN SYSTEM I

IF NICAM

TR1 BC548B

TR18 BC548B

L15 6µ8 BP7 5.5MHz SYS B/G ONLY

SYS I ONLY

VIDEO LEVEL

TR17 BC558B

IF CVBS

x=20µS/dIv y=2V/dIv

x=50µS/dIv y=1V/dIv

IC4 TDA8124

DEMOD

COMP

AFC

AFC OUT

POLA-RITY IDENT

FLIP FLOP

SIGNAL IDENT

CVBS

19 EN

IC12 2A NE 567

PHASE DETECTOR

CURRENT CONTROLLED OSCILLATOR

AMP

QUADRATURE PHASE DETECTOR

V REF

REF FREQ

IC13 4052

DECODER

IC9 LM358N

AFC UNDER

AFC OVER

IC6 PCF 8574P

I/O PORTS

I²C BUS CONTR.

STOP TUN

VIDEO IDENT

SYS I ONLY

SYS B/G ONLY

IF SOUND L

IF SOUND R

TV SYSTEM INFO

MUTE SYS I

IC1 TDA9820 FM SOUND DEMODULATOR

7 STAGE LIMITER-AMPLIFIER

VCO1

VCO2

TV SYSTEM CONTROL

SUPPLY

MUTE

SYSTEM I N.C.

SYSTEM B/G N.C.

SYSTEM B/G ONLY

SYSTEM I ONLY

SYSTEM B/G ONLY

DEEMPHA-SIS AND DEMATRIX

AF SWITCH

SOURCE SELEC-TOR

54.7kHz

117Hz

274Hz

STEREO

DUAL

LOGIC

FREQ DIVID

POWER-ON RESET

OSC

SUPPLY

I²C-BUS TRANS-CEIVER

IC2 TDA 8417

X1 10MHz

CH SEP

IF SOUND LEFT

IF SOUND RIGHT

SDA2

SCL2

IC8 4053

LEVEL MATCHING

TR16 BC548

TR28 BC558

TR22 BC558B

TR32 BC548B

TR31 BC548B

TR19 BC548B

TR15 BC548B

TR14 BC548B

TR24 BC548B

TR25 BC548B

IF SOUND L

IF SOUND R

SDA2

SCL2

SYS I ONLY

SYS B/G ONLY

MUTE SYS I

TV SYSTEM INFO

■ IF THE TV IS NOT FITTED WITH NICAM PCB, P7 HAS CONNECTION TO P59 ON THE VIDEO & SOUND SWITCHING PCB

DIAGRAM B PAL DECODER

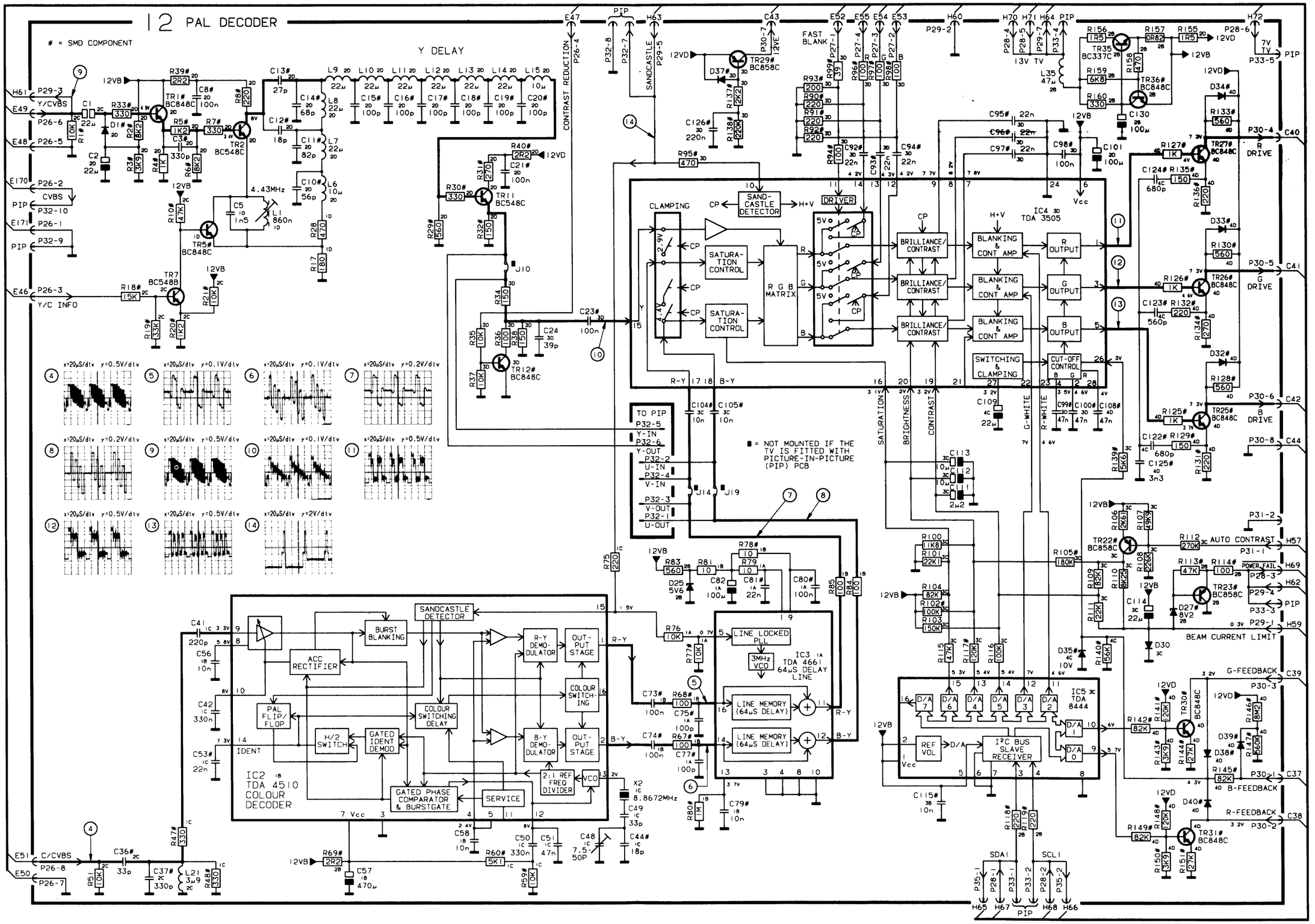


DIAGRAM B PAL/SECAM DECODER (○ = FOR OSCILLOSCOPE PICTURES SEE PAGE 2-5)

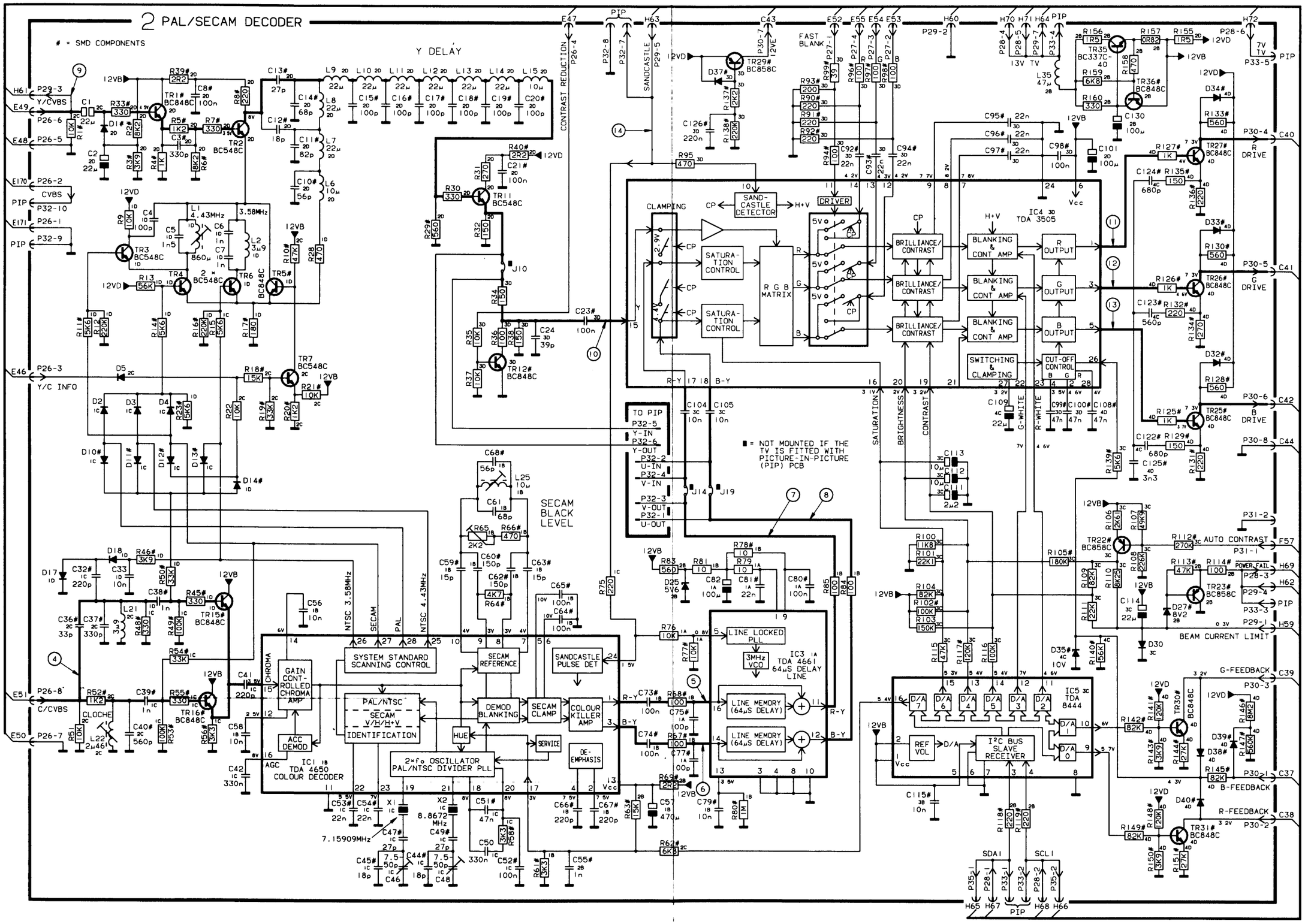


DIAGRAM C VIDEO OUTPUT & SOUND OUTPUT

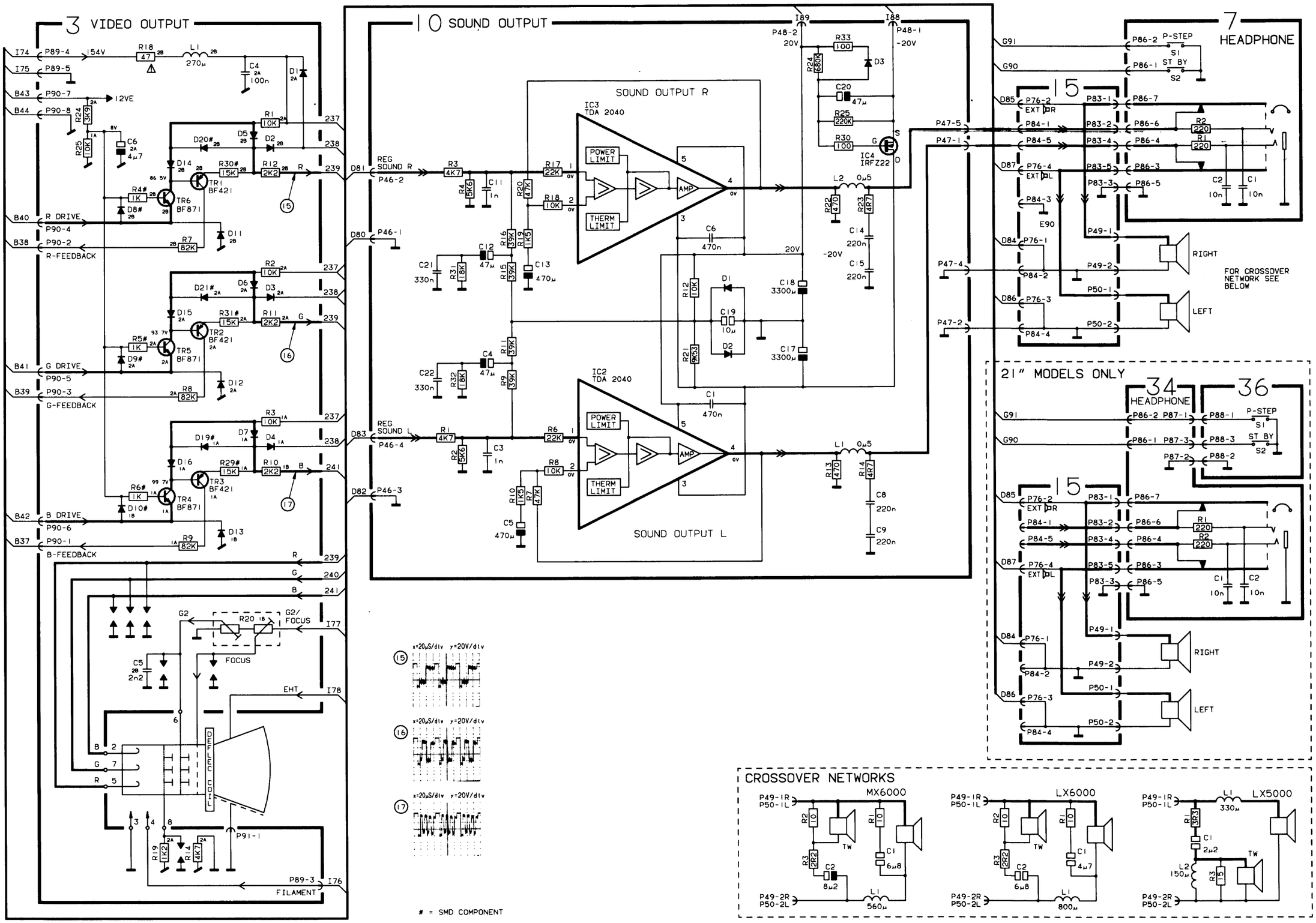
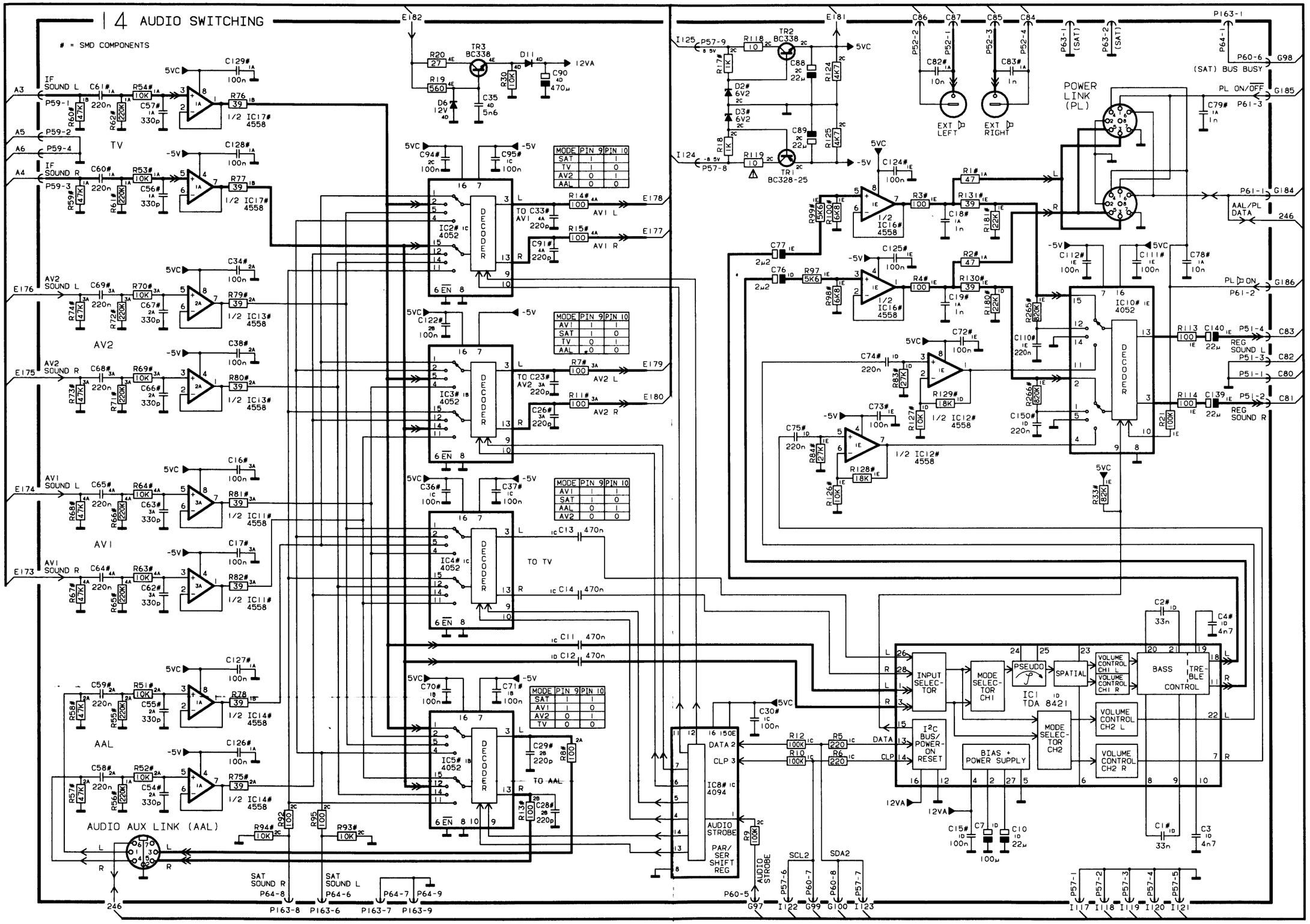


DIAGRAM D SOUND SWITCHING & CONTROL



14
VIDEO SWITCHING

= SMD COMPONENTS

SERVICE MODE

POWER SUPPLY

VIDEO SWITCH

I²C BUS DECODER
IC9 3C
TEA6416

RGB SWITCH
IC6 4B
TEA 5115

MOTORIZED STAND

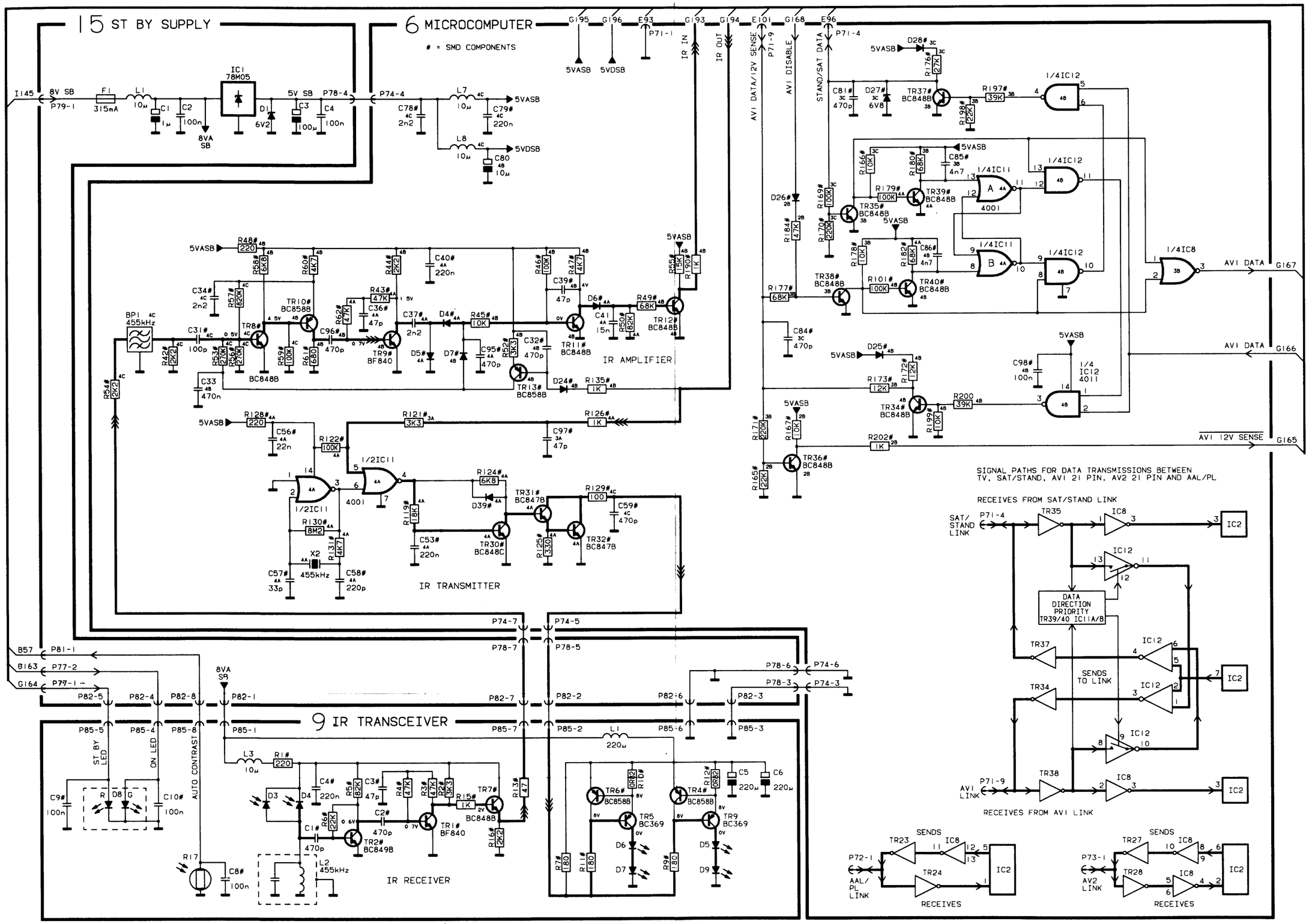
POWERFAIL

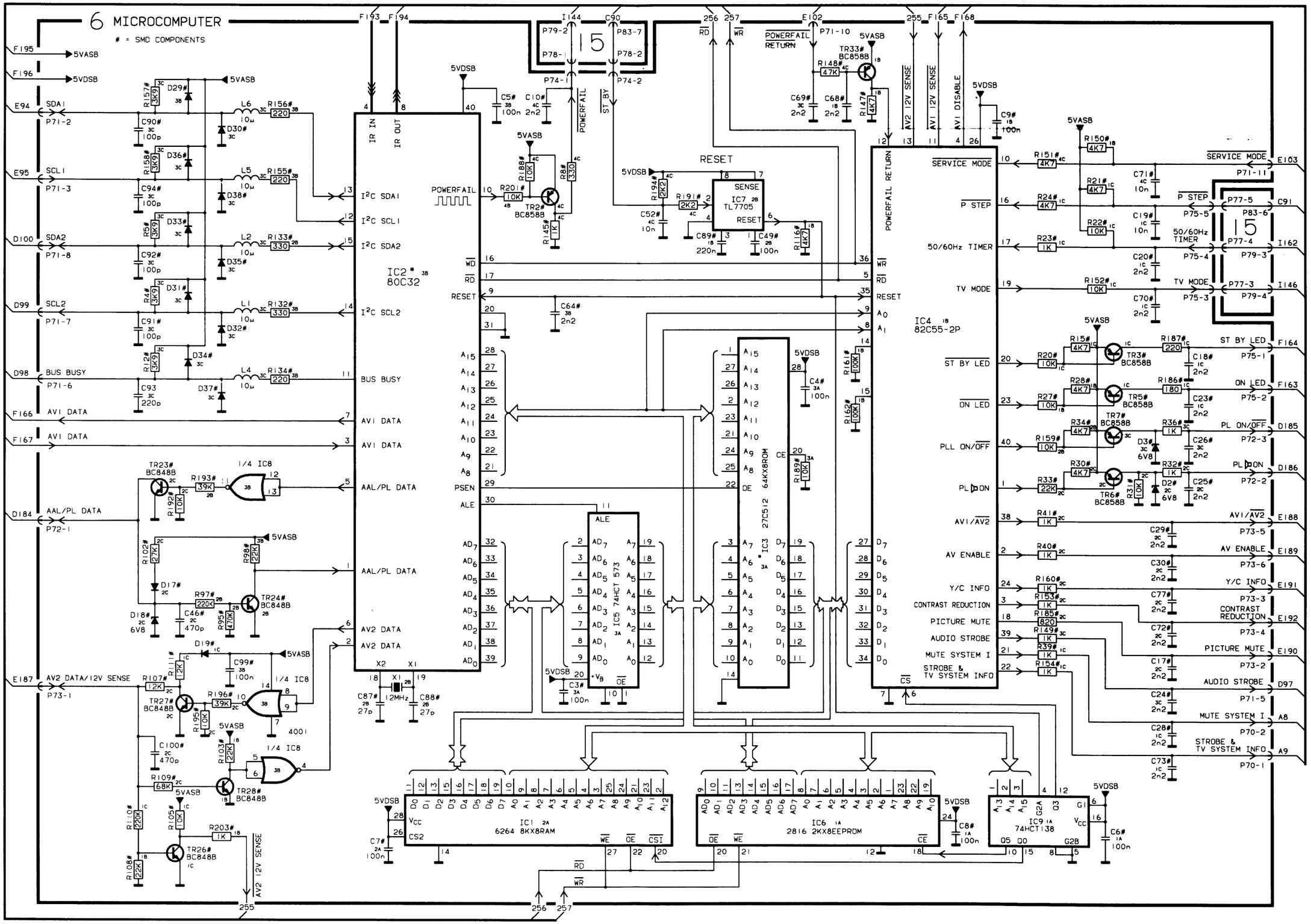
PICTURE MUTE

AV1

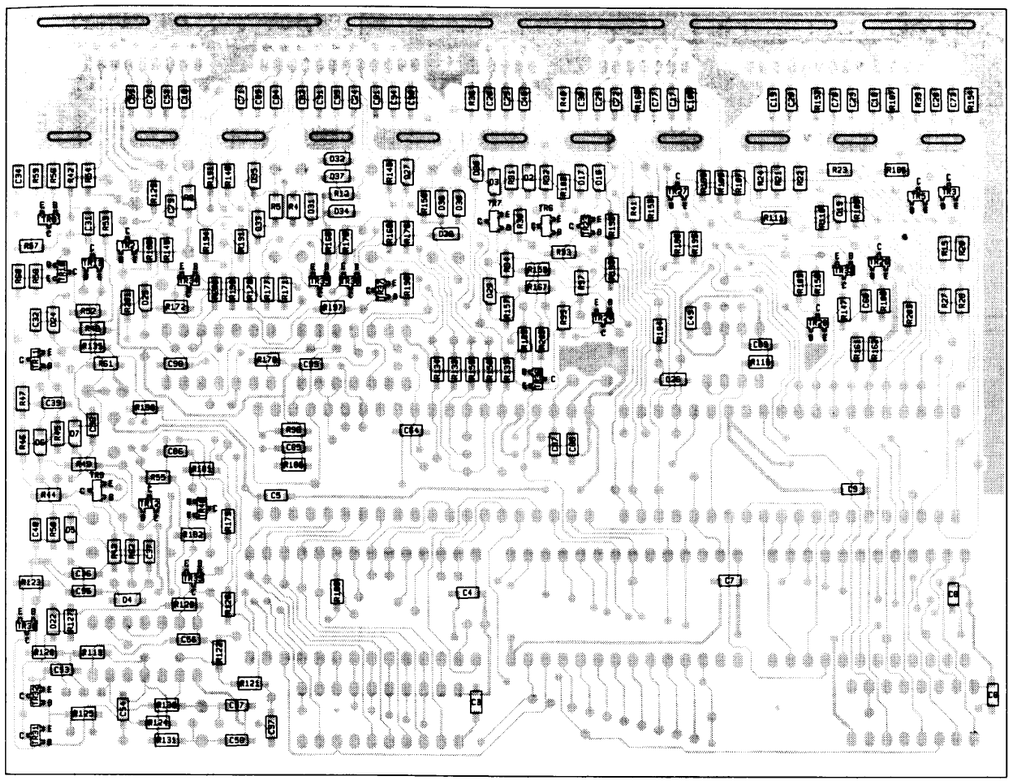
AV2

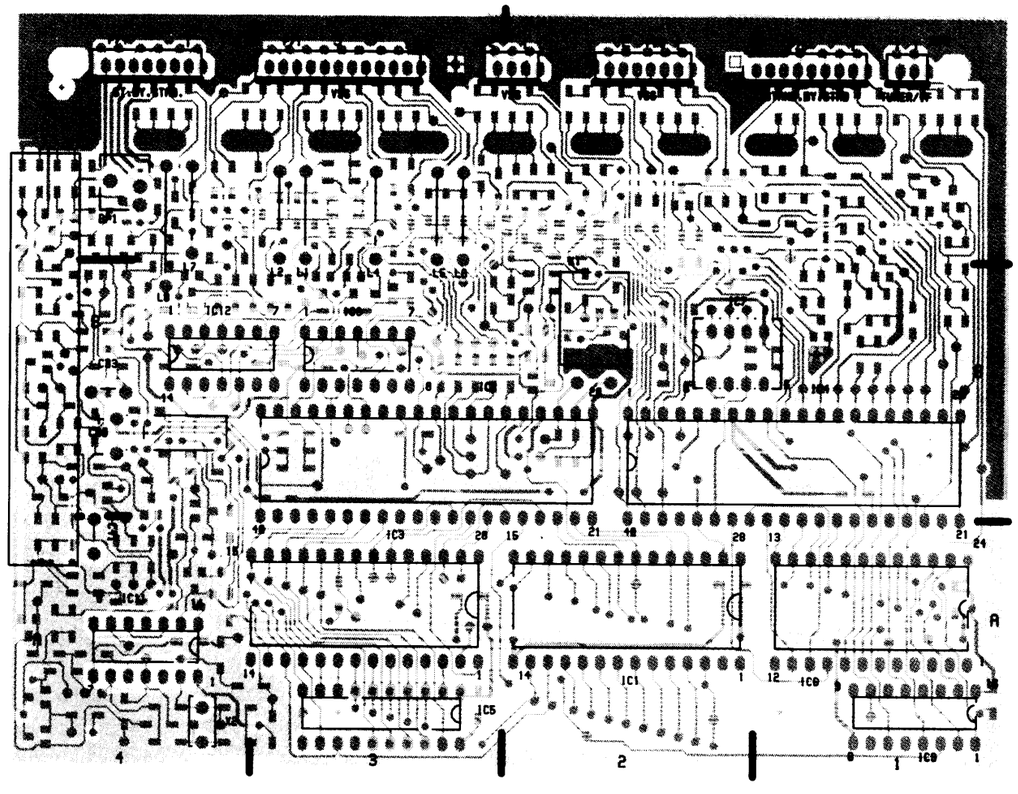
DIAGRAM F IR TRANSCEIVER AND 5V ST BY SUPPLY



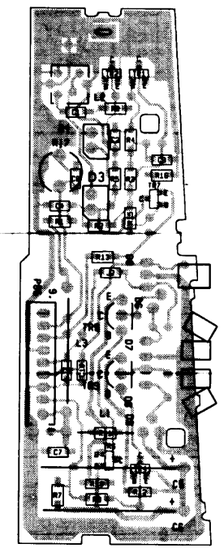

6 MICROCOMPUTER
= SMD COMPONENTS
IC2 * 80C32
IC4 82C55-2P
IC1 6264 8KX8RAM
IC6 2816 2KX8EEPROM
IC9 74HCT138
IC5 74HCT 573
IC7 TL7705
IC3 27C512 64KX8ROM
RESET
POWERFAIL
ST BY
SERVICE MODE
P STEP
50/60Hz TIMER
TV MODE
ST BY LED
ON LED
PLL ON/OFF
PL ON
AV1/AV2
AV ENABLE
Y/C INFO
CONTRAST REDUCTION
PICTURE MUTE
AUDIO STROBE
MUTE SYSTEM I
STROBE & TV SYSTEM INFO
AV2 12V SENSE
AV1 12V SENSE
AV1 DISABLE
POWERFAIL RETURN
AV1 DATA
AAL/PL DATA
AV2 DATA
AV2 DATA/12V SENSE
SDA1
SCL1
SDA2
SCL2
BUS BUSY
I²C SDA1
I²C SCL1
I²C SDA2
I²C SCL2
12MHz
4001
1/4 IC8

PCB 6





PCB 9



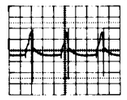
2-13 2-13

OSCILLOSCOPE PICTURES FOR POWER SUPPLY & DEFLECTION

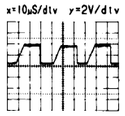
PCB 14

(40) x=10µS/dtv y=5V/dtv

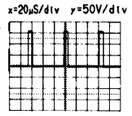
(51) x=20µS/dtv y=0.5V/dtv



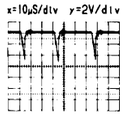
(41) x=10µS/dtv y=2V/dtv



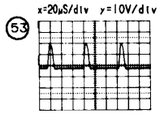
(52) x=20µS/dtv y=50V/dtv



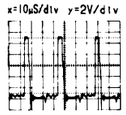
(42) x=10µS/dtv y=2V/dtv



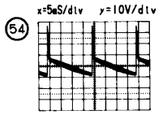
(53) x=20µS/dtv y=10V/dtv



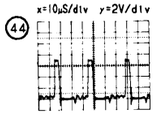
(43) x=10µS/dtv y=2V/dtv



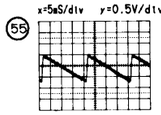
(54) x=5µS/dtv y=10V/dtv



(44) x=10µS/dtv y=2V/dtv



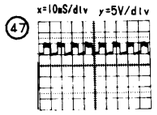
(55) x=5µS/dtv y=0.5V/dtv



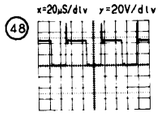
(45) x=5µS/dtv y=5V/dtv

(46) x=20µS/dtv y=200V/dtv

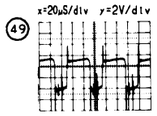
(47) x=10µS/dtv y=5V/dtv



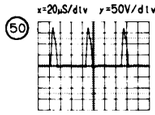
(48) x=20µS/dtv y=20V/dtv



(49) x=20µS/dtv y=2V/dtv



(50) x=20µS/dtv y=50V/dtv



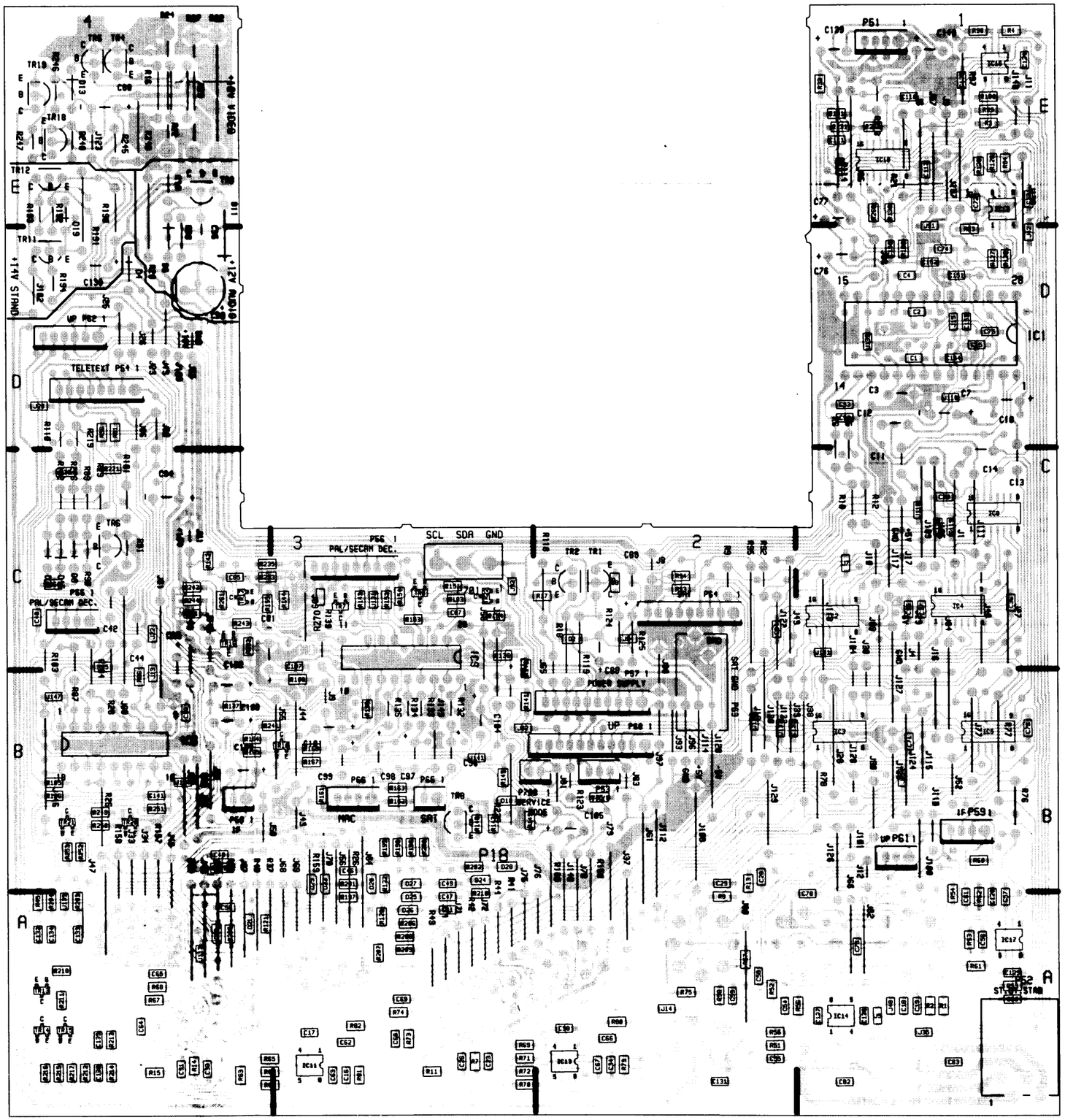


DIAGRAM H TELETEXT AND SYNC PROCESSING

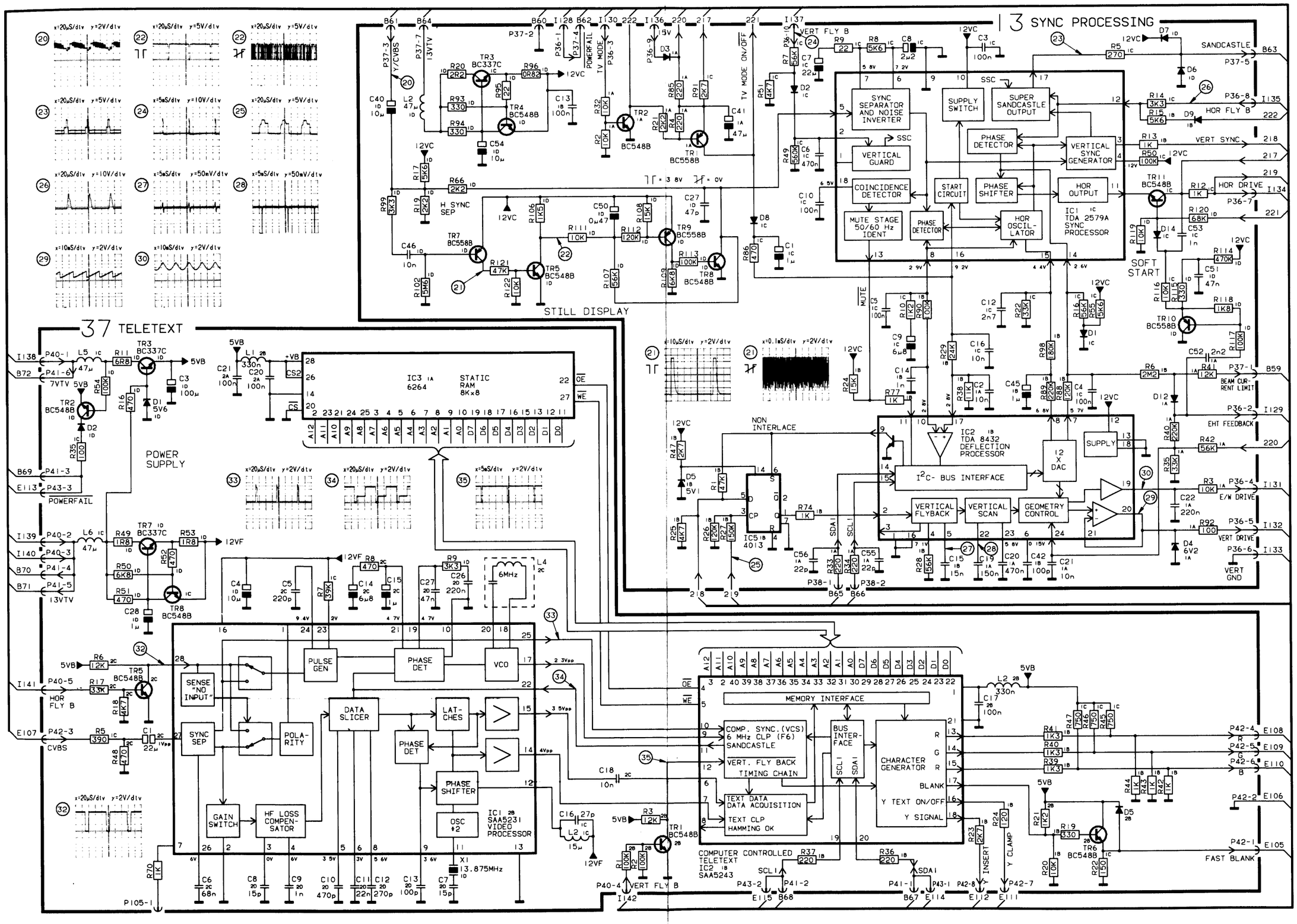


DIAGRAM I POWER SUPPLY & DEFLECTION (○ = FOR OSCILLOSCOPE PICTURES SEE PAGE 2-13)

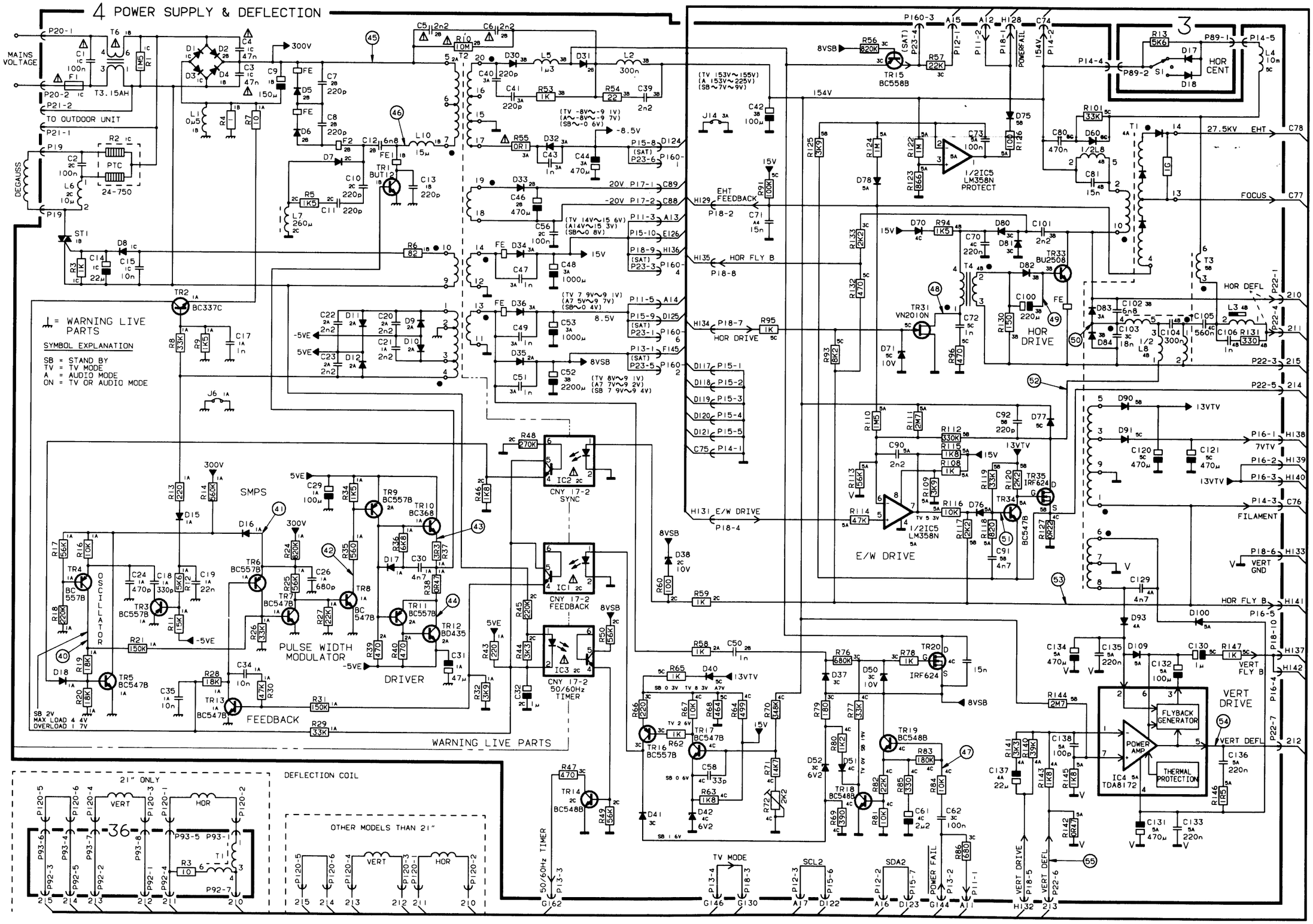
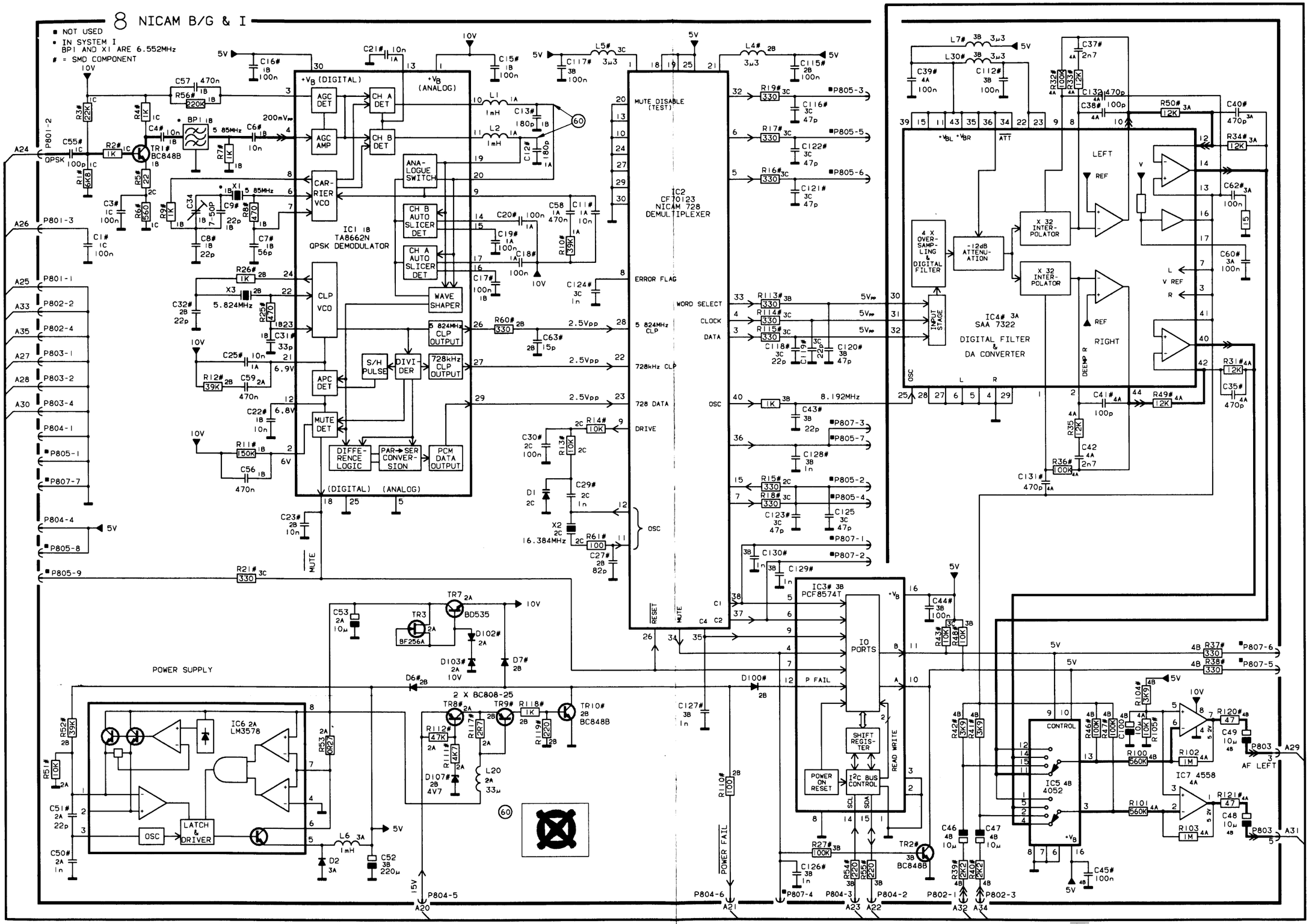
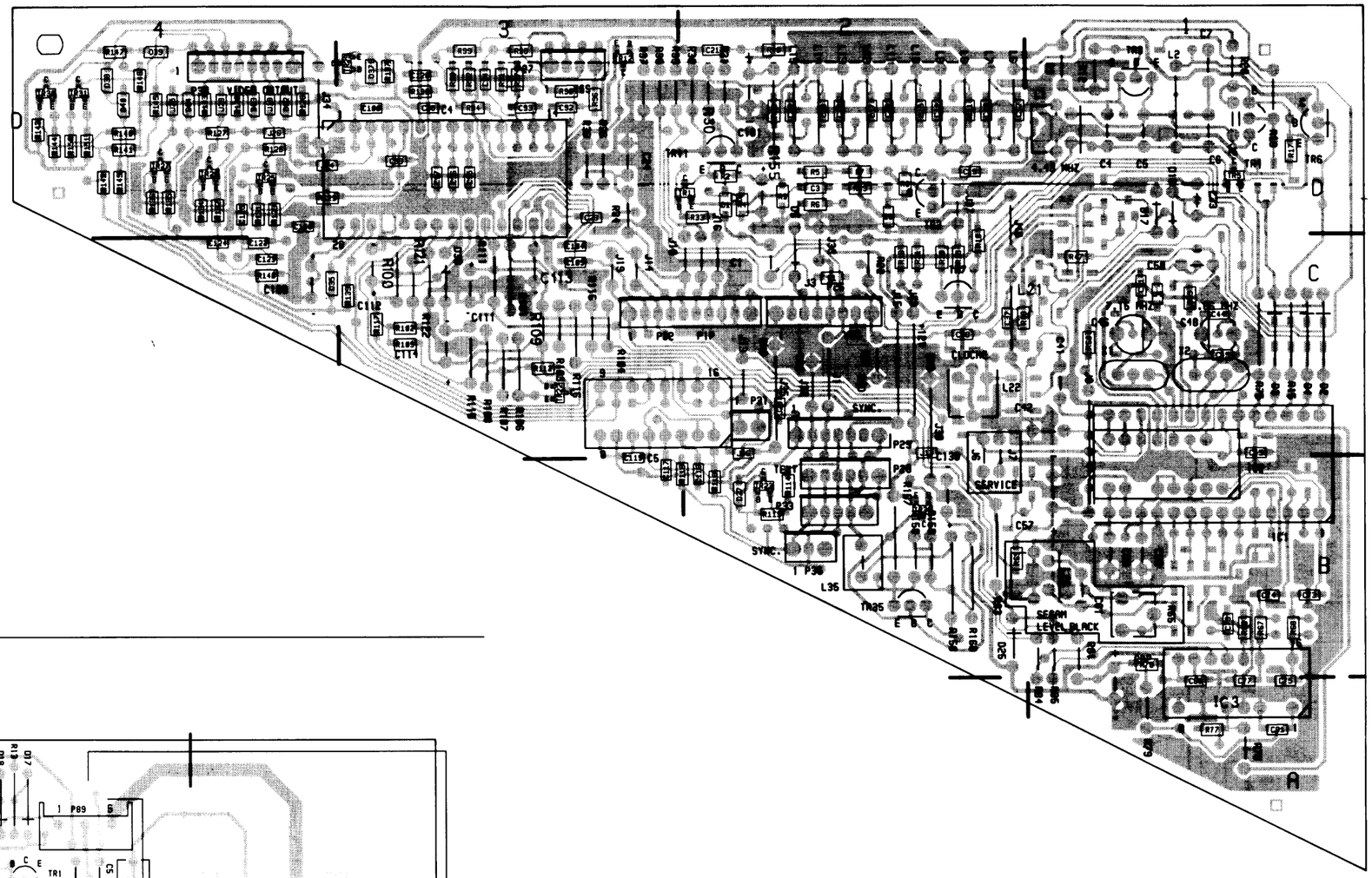

4 POWER SUPPLY & DEFLECTION
3
MAINS VOLTAGE
P20-1
P20-2
P21-2
P21-1
TO OUTDOOR UNIT
DEGAUSS
24-750
300V
SMPS
OSCILLATOR
PULSE WIDTH MODULATOR
DRIVER
FEEDBACK
5VE
-5VE
8VSB
CNY 17-2 SYNC
CNY 17-2 FEEDBACK
CNY 17-2 50/60Hz TIMER
WARNING LIVE PARTS
= WARNING LIVE PARTS
SYMBOL EXPLANATION
SB = STAND BY
TV = TV MODE
A = AUDIO MODE
ON = TV OR AUDIO MODE
SB 2V MAX LOAD 4 4V OVERLOAD 1 7V
21" ONLY
DEFLECTION COIL
OTHER MODELS THAN 21"
VERT
HOR
50/60Hz TIMER
TV MODE
SCL2
SDA2
POWER FAIL
VERT DRIVE
VERT DEFL
154V
15V
-8.5V
8.5V
13VTV
EHT FEEDBACK
HOR FLY B
HOR DRIVE
E/W DRIVE
POWERFAIL
HOR CENT
27.5KV EHT
FOCUS
HOR DEFL
FILAMENT
VERT GND
VERT FLY B
VERT DRIVE
FLYBACK GENERATOR
THERMAL PROTECTION
I/2IC5 LM358N PROTECT
I/2IC5 LM358N
TDA8172
TR15 BC558B
TR31 VN2010N
TR33 BU2508
TR34 IRF624
TR35 IRF624
TR19 BC548B
TR20 IRF624
TR16 BC557B
TR17 BC547B
TR18 BC548B
TR14 BC548B
TR13 BC547B
TR12 BD435
TR11 BC557B
TR10 BC368
TR9 BC557B
TR8 BC547B
TR7 BC547B
TR6 BC557B
TR5 BC547B
TR4 BC557B
TR3 BC557B
TR2 BC337C
TR1 BUT12
IC1 CNY 17-2
IC2 CNY 17-2
IC3 CNY 17-2
IC4 TDA8172
T1
T2
T3
T4
L1 L2 L3 L4 L5 L6 L7 L8 L10
D1 D2 D3 D4 D5 D6 D7 D8 D10 D11 D12 D15 D16 D17 D18 D31 D32 D33 D34 D35 D36 D37 D38 D40 D41 D42 D50 D51 D52 D70 D71 D75 D76 D77 D78 D80 D81 D82 D83 D84 D90 D91 D93 D100 D109
ST1
D17
D18
D69
D60
D61
D62
D63
D64
D65
D66
D67
D68
D69
D70
D71
D72
D73
D74
D75
D76
D77
D78
D79
D80
D81
D82
D83
D84
D85
D86
D87
D88
D89
D90
D91
D92
D93
D94
D95
D96
D97
D98
D99

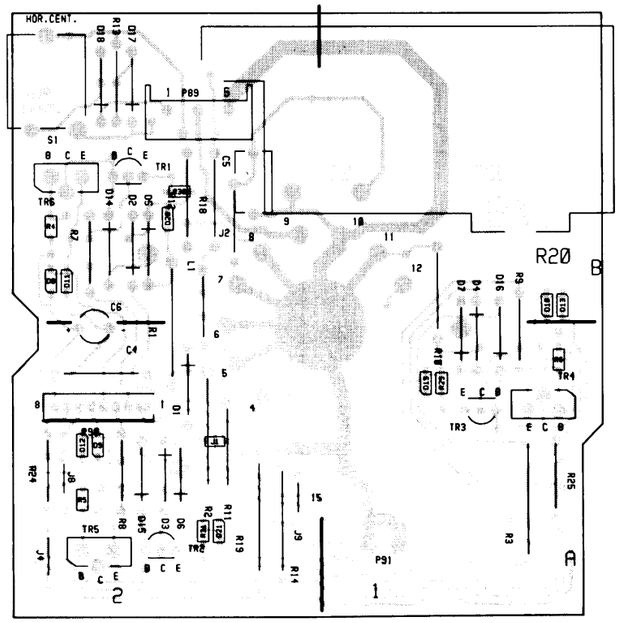
DIAGRAM J NICAM SYSTEM B/G & I



PCB 12

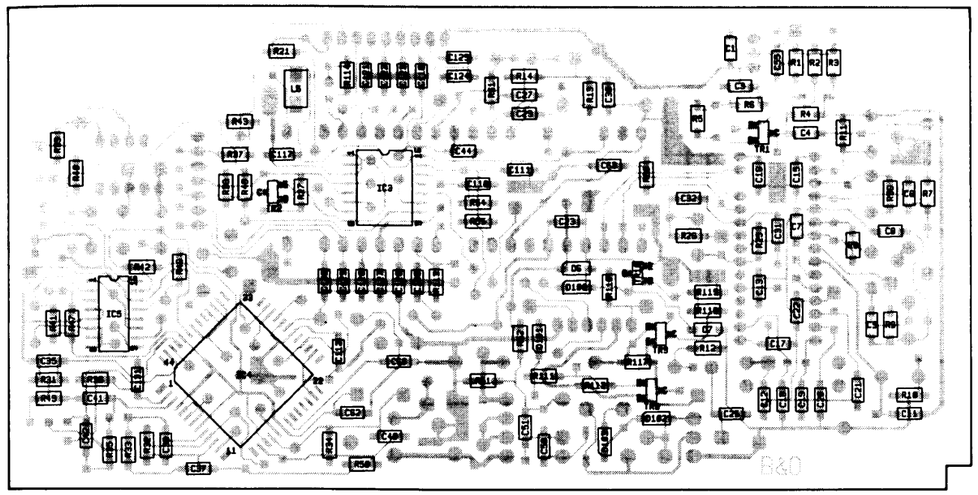

SERVICE
SCREEN LEVEL BLACK
IC3

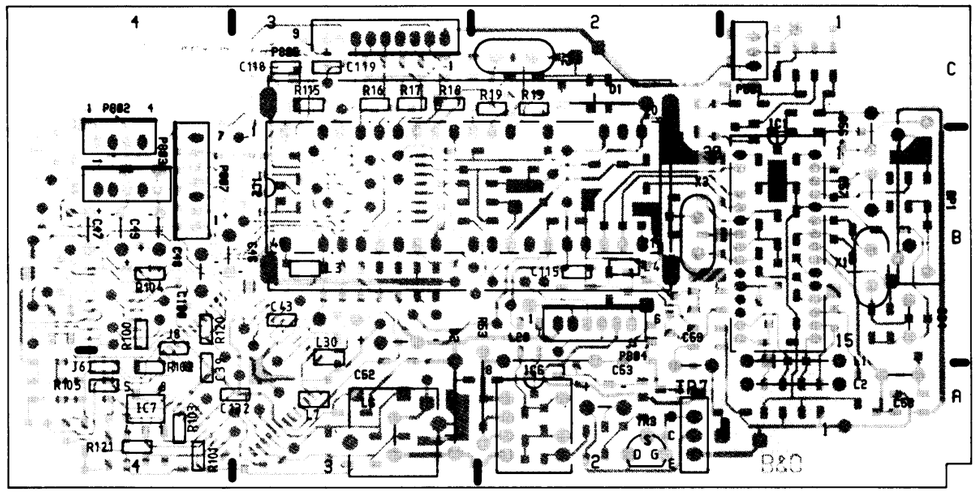
PCB 3


HOR.CENT.
P89
P91
R20
TR1
TR2
TR3
TR4
TR5
TR6

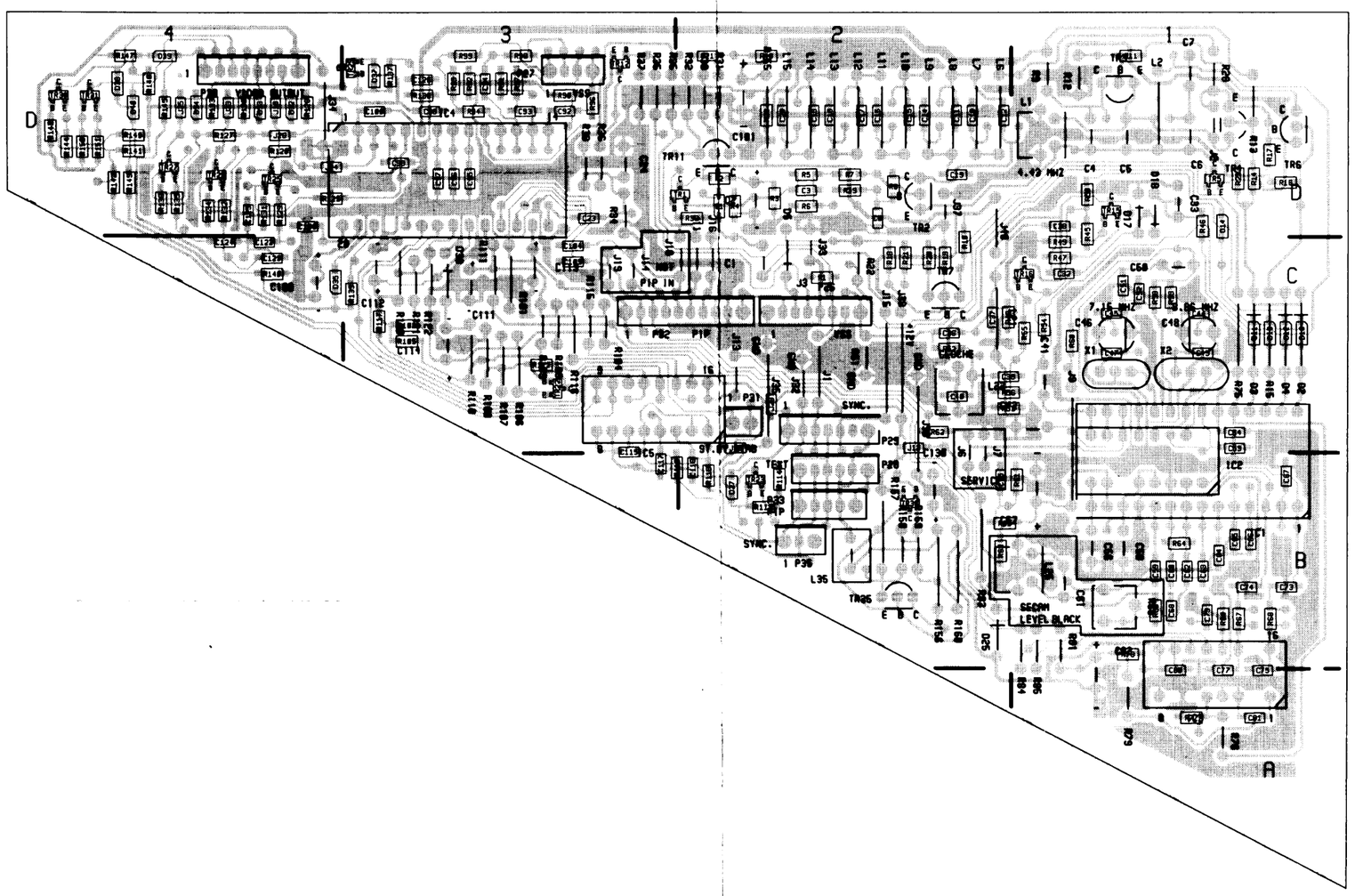
2-18 2-18

PCB 8





PCB 2



OVERALL BLOCK DIAGRAM

Overall block diagram system B/G/L for Tuner & IF system B/G or I PCB38 and Pal Decoder PCB12, see separate block diagrams

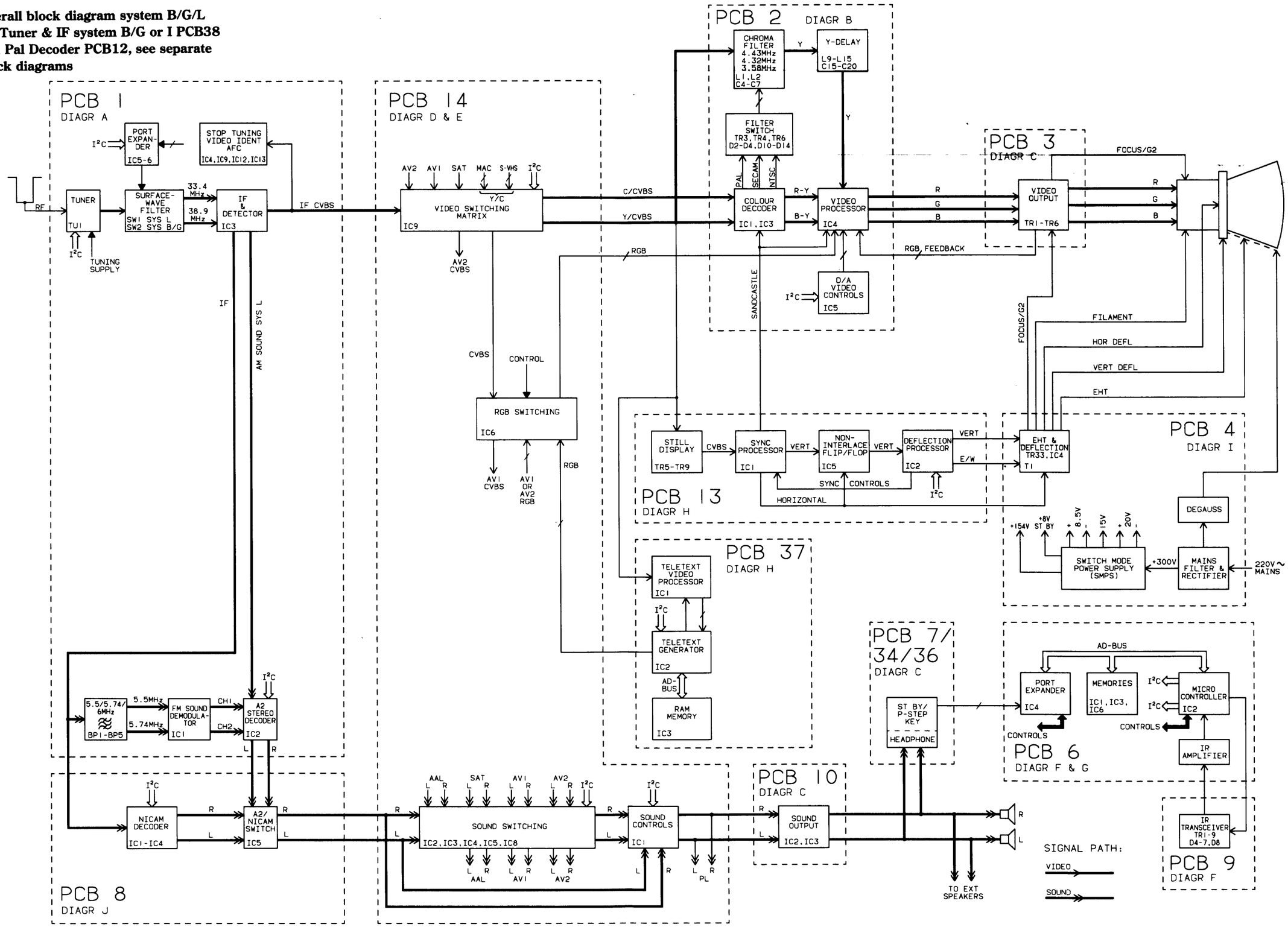
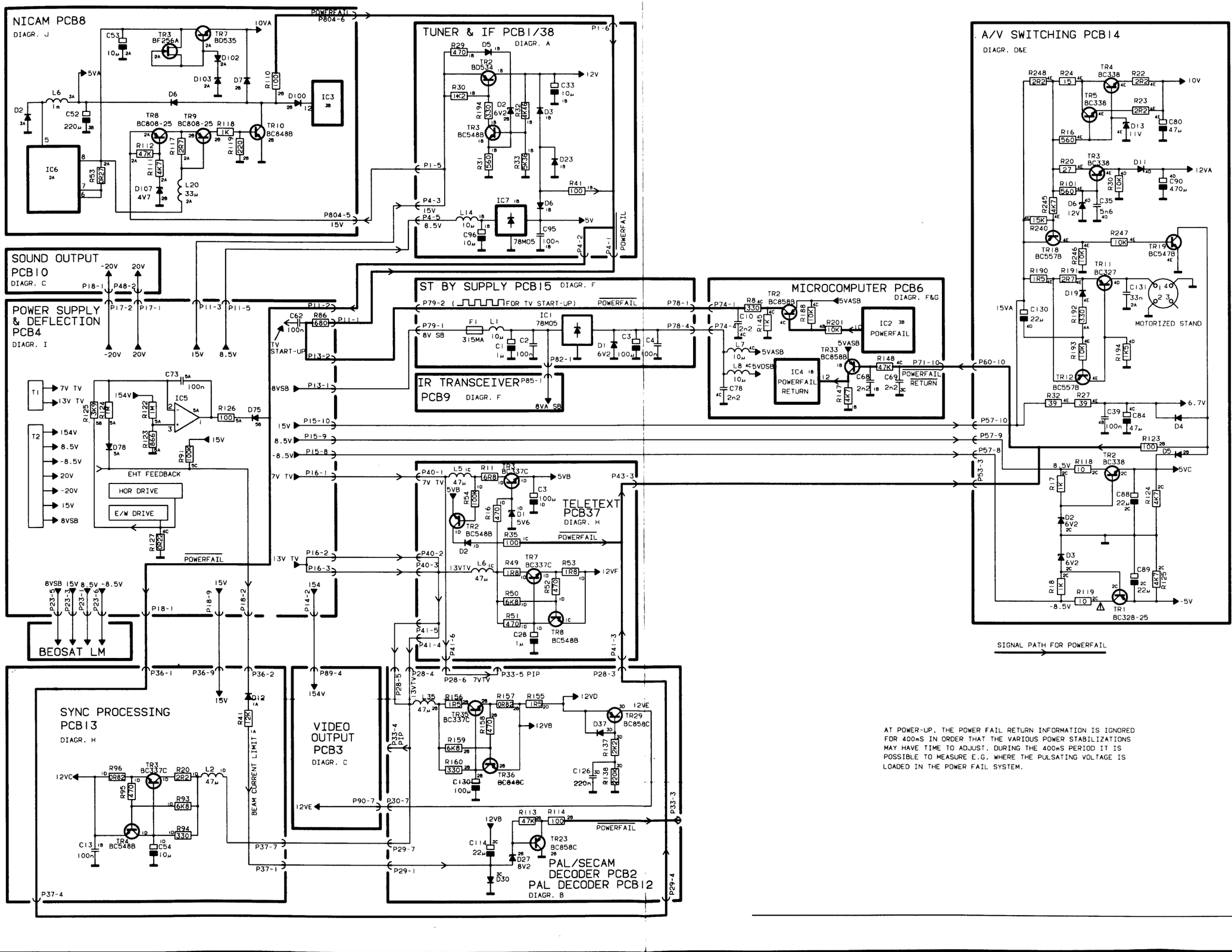
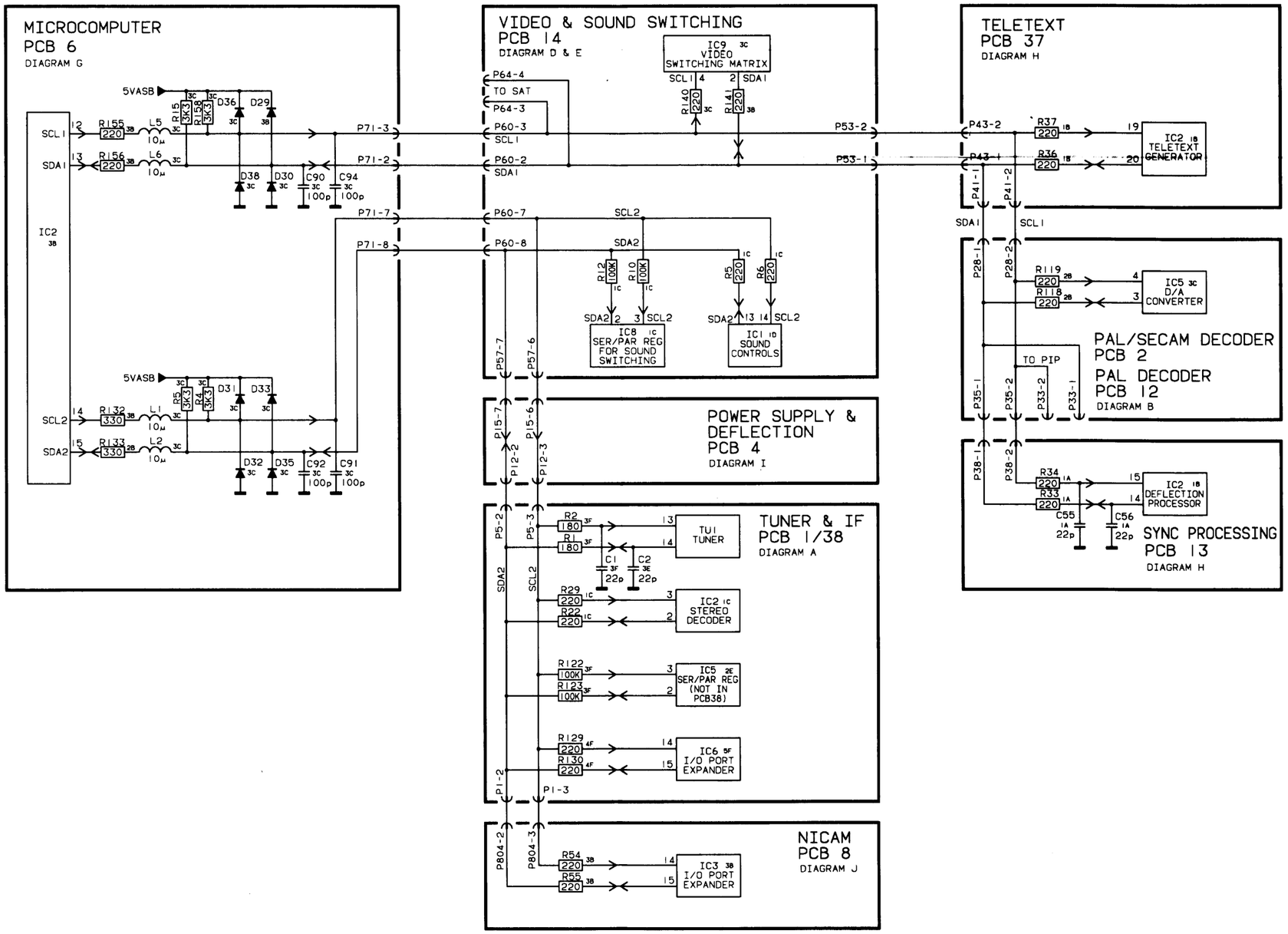


DIAGRAM FOR POWER SUPPLY AND POWER FAIL

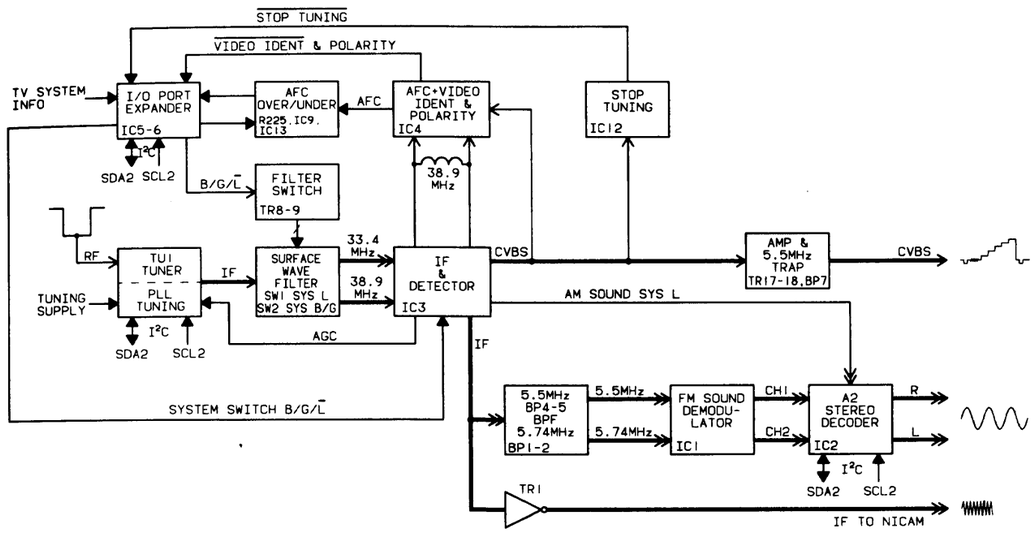


AT POWER-UP, THE POWER FAIL RETURN INFORMATION IS IGNORED FOR 400mS IN ORDER THAT THE VARIOUS POWER STABILIZATIONS MAY HAVE TIME TO ADJUST. DURING THE 400mS PERIOD IT IS POSSIBLE TO MEASURE E.G. WHERE THE PULSATING VOLTAGE IS LOADED IN THE POWER FAIL SYSTEM.

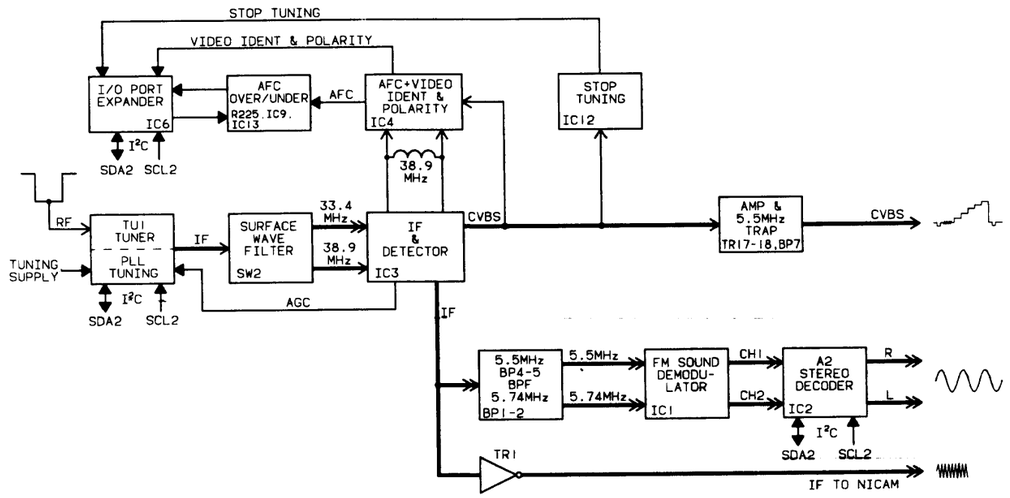
BLOCK DIAGRAM I²C BUS



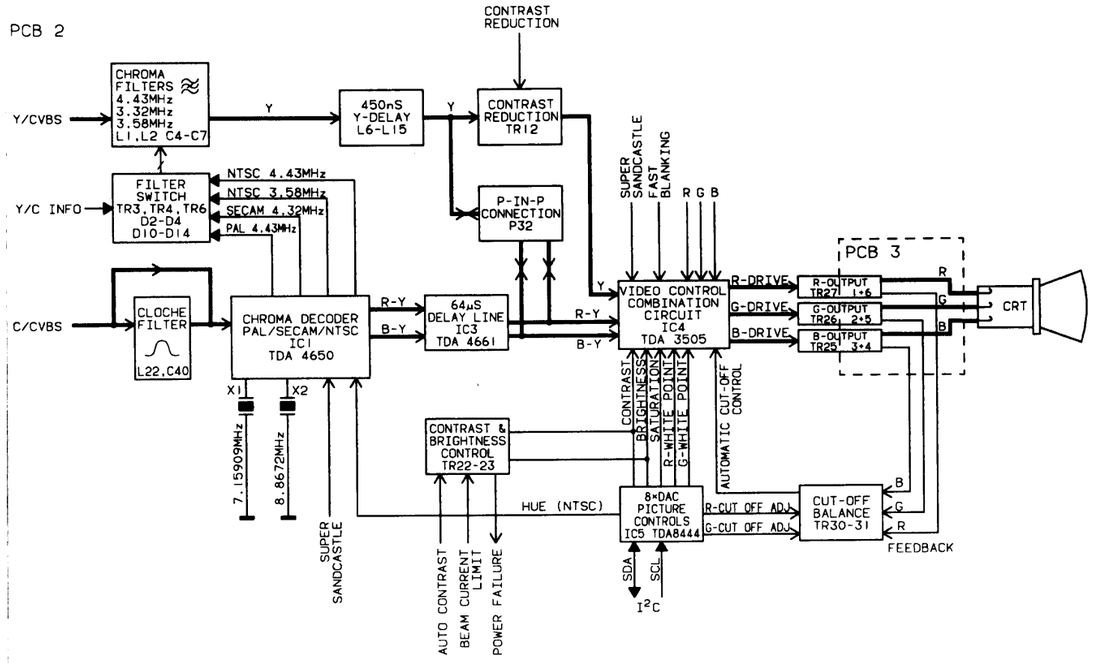
BLOCK DIAGRAM TUNER & IF SYSTEM B/G/L



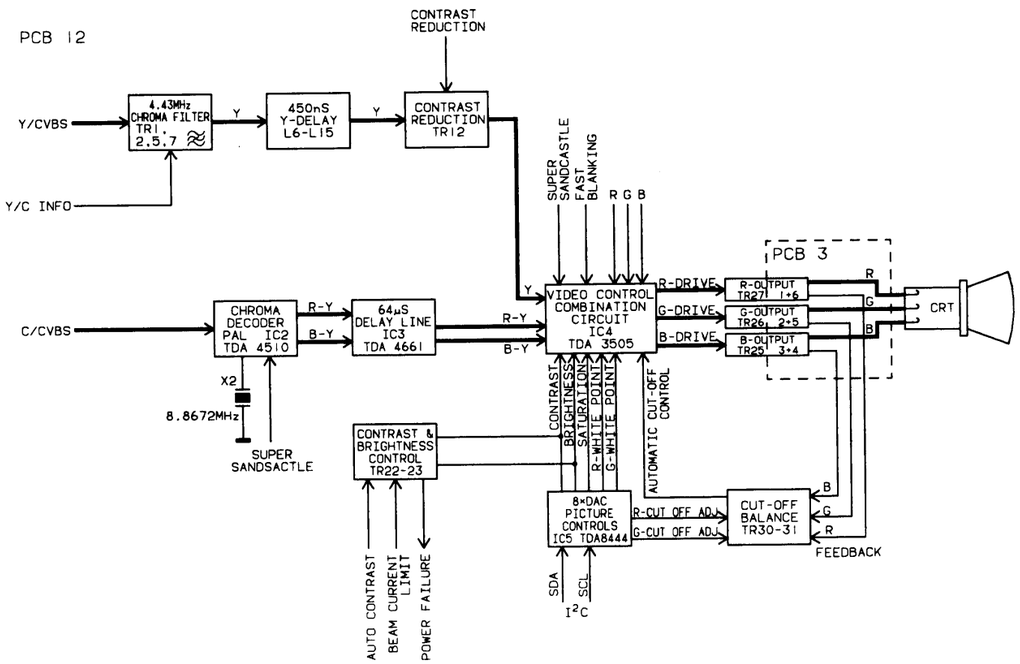
BLOCK DIAGRAM TUNER & IF SYSTEM B/G & I



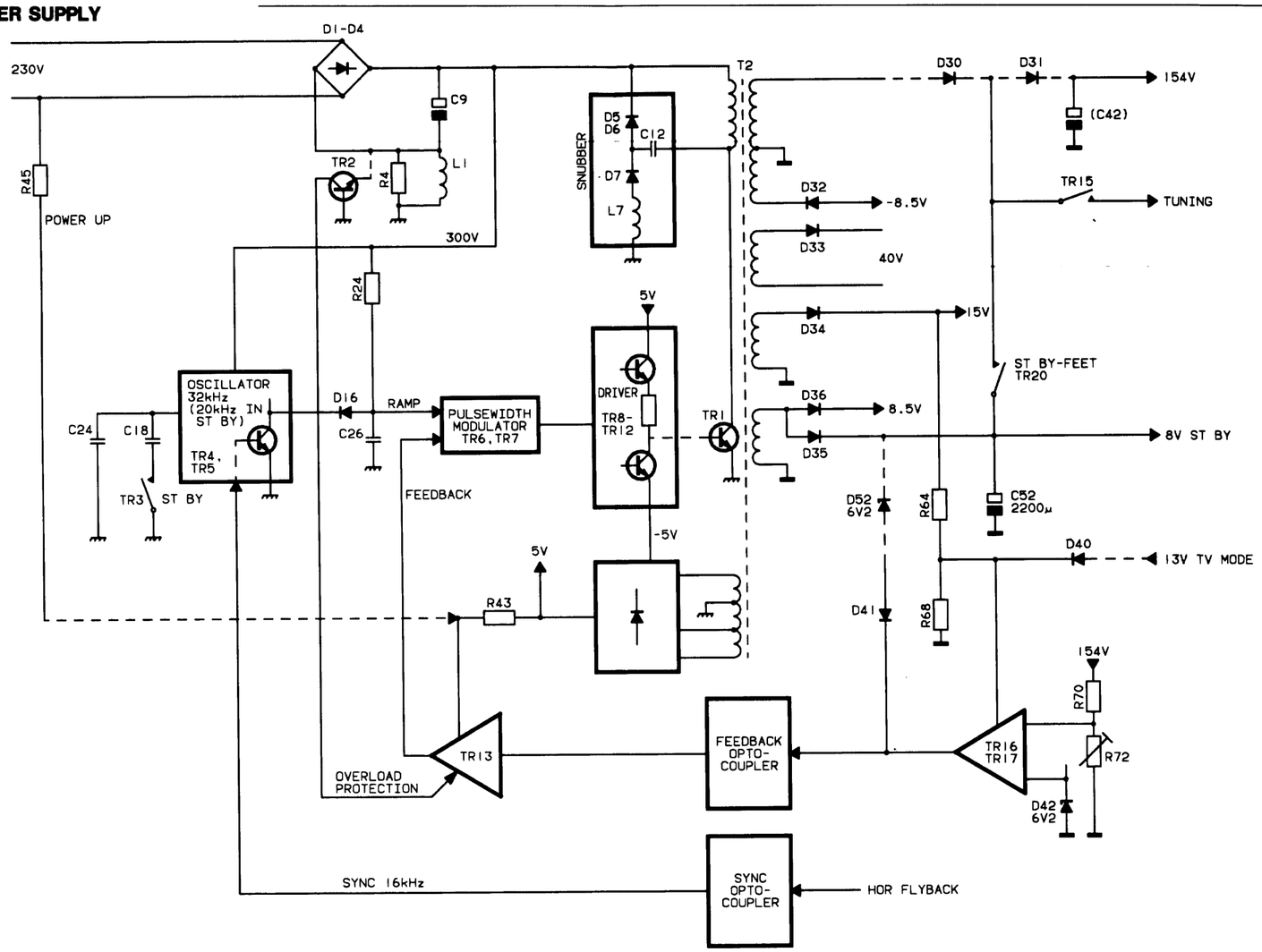
BLOCK DIAGRAM PAL/SECAM DECODER



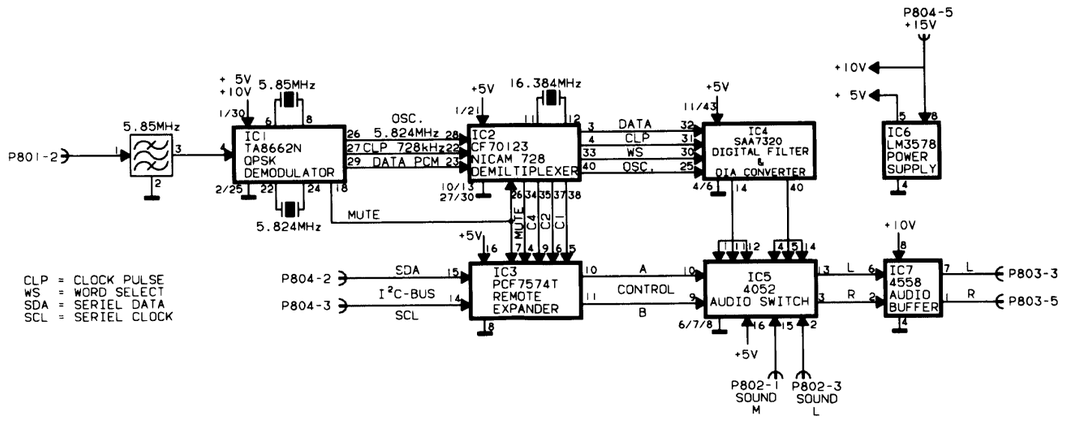
BLOCK DIAGRAM PAL DECODER



BLOCK DIAGRAM SWITCH MODE POWER SUPPLY



BLOCK DIAGRAM NICAM



BLOCK DIAGRAM POWER SUPPLY & DEFLECTION

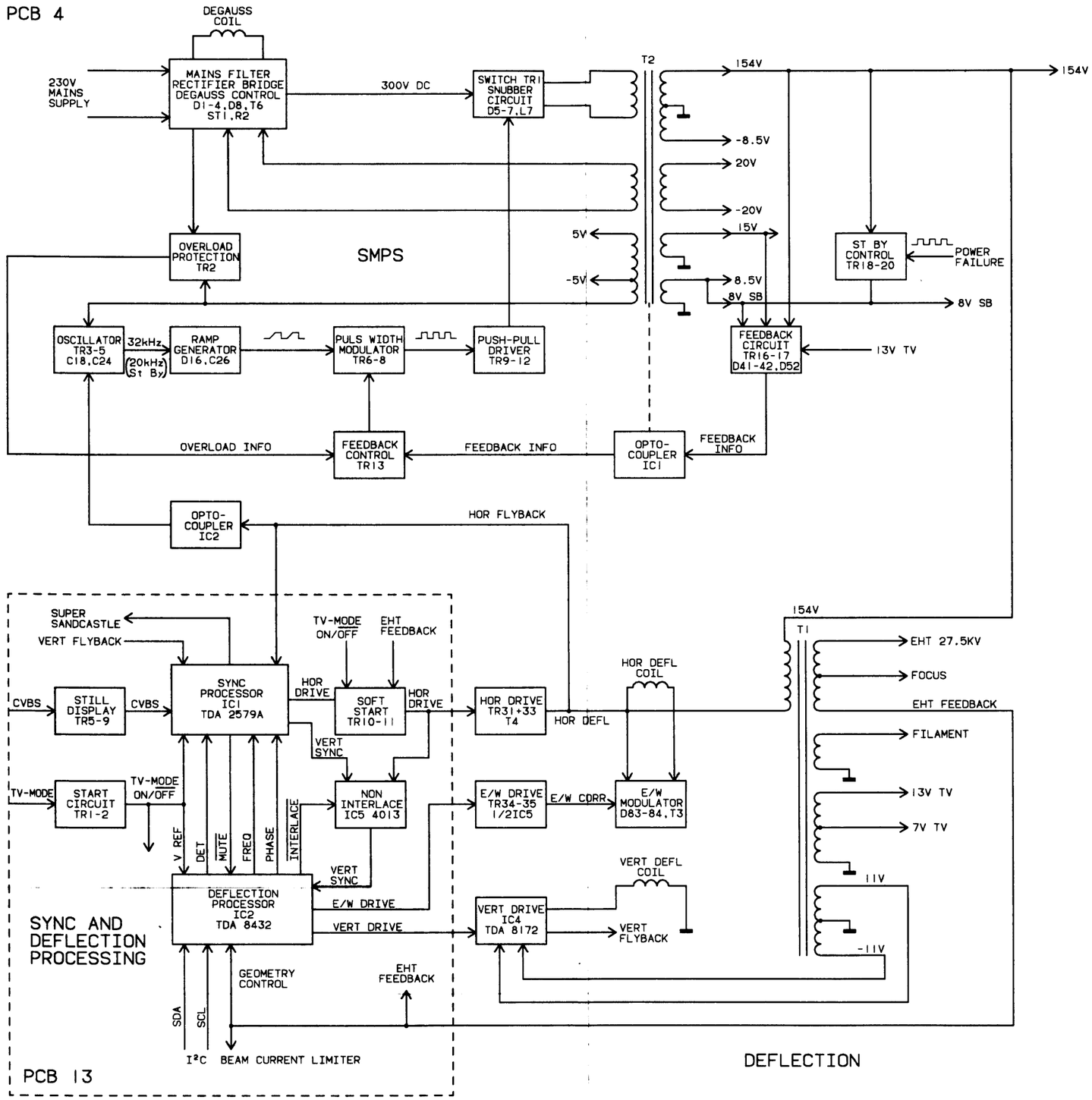


DIAGRAM A TUNER & IF SYSTEM B/G/L/I

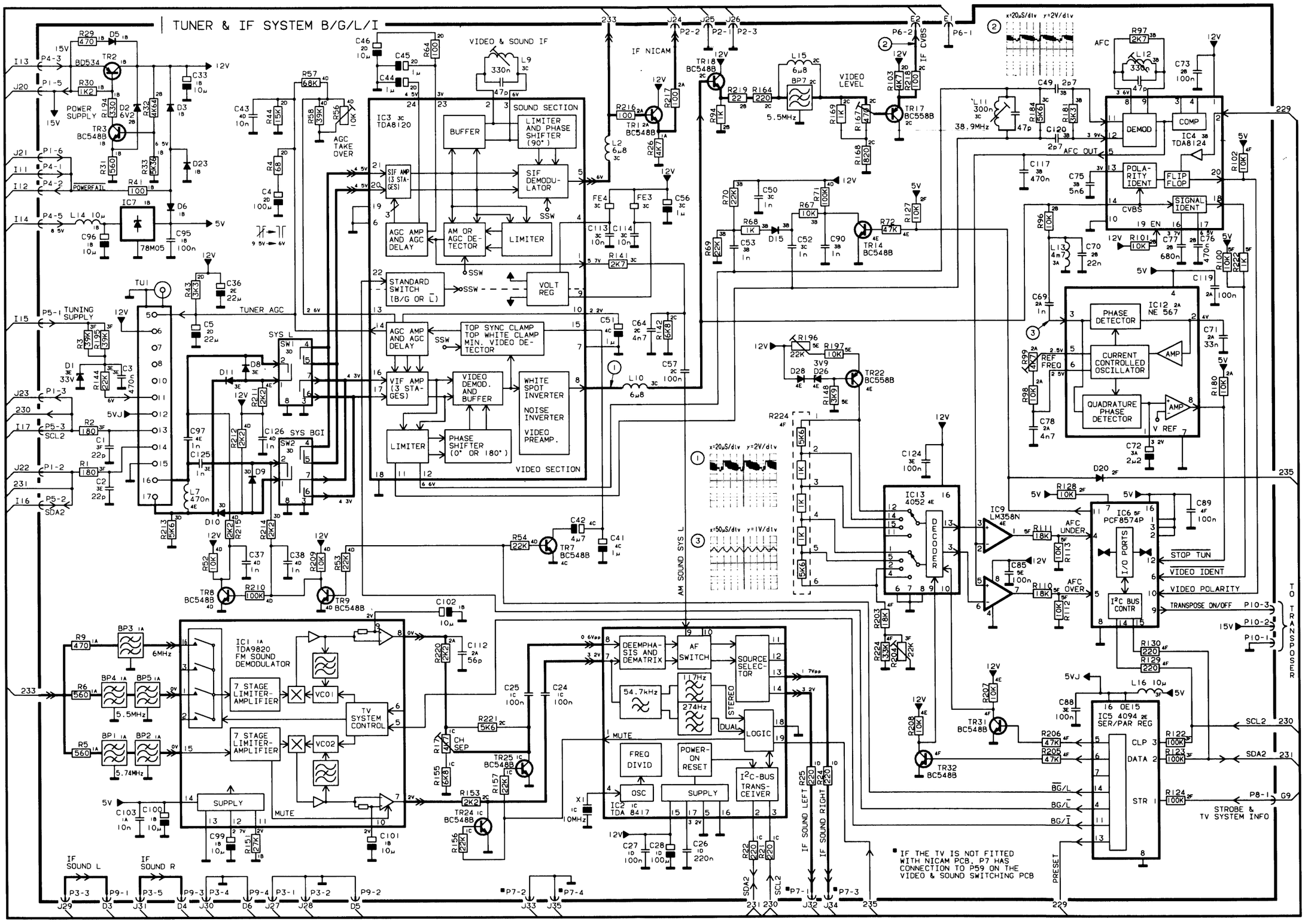


DIAGRAM A TUNER & IF SYSTEM B/G/D/K

TUNER & IF SYSTEM B/G/D/K

VIDEO & SOUND IF

IF NICAM

VIDEO SECTION

SOUND SECTION

IC3 TDA8120

IC1 TDA9820 FM SOUND DEMODULATOR

IC2 TDA 8417

IC4 TDA8124

IC6 PCF8574P

IC9 LM358N

IC12 NE 567

IC13 4052

IC5 4094 SER/PAR REG

IC7 78M05

TUNING SUPPLY

POWER SUPPLY

AGC TAKE OVER

TUNER AGC

SYS DK

SYS BGI

SCL2

SDA2

IF SOUND L

IF SOUND R

IF SOUND LEFT

IF SOUND RIGHT

STROBE & TV SYSTEM INFO

TO TRANSPOSER

PRESET

■ IF THE TV IS NOT FITTED WITH NICAM PCB, P7 HAS CONNECTION TO P59 ON THE VIDEO & SOUND SWITCHING PCB

DIAGRAM A TUNER & IF SYSTEM B/G/M

TUNER & IF SYSTEM B/G/M

VIDEO & SOUND IF

IF NICAM

IF CVBS

SOUND SECTION

VIDEO SECTION

IC3 TDA8120

IC1 TDA9820 FM SOUND DEMODULATOR

IC2 TDA 8417

IC4 TDA8124

IC5 4094 SER/PAR REG

IC6 PCF8574P

IC12 NE 567

IC13 4052

IC7 78M05

TU1

TR1 BC548B

TR2 BD534

TR3 BC548B

TR7 BC548B

TR8 BC548B

TR9 BC548B

TR14 BC548B

TR17 BC558B

TR18 BC548B

TR22 BC558B

TR24 BC548B

TR25 BC548B

TR26 BC338-25

TR31 BC548B

TR32 BC548B

POWER SUPPLY

POWERFAIL

AGC TAKE OVER

TUNER AGC

SYS M

SYS BG

TUNING SUPPLY

SCL2

SDA2

IF SOUND L

IF SOUND R

IF SOUND SYS M

IF SOUND LEFT

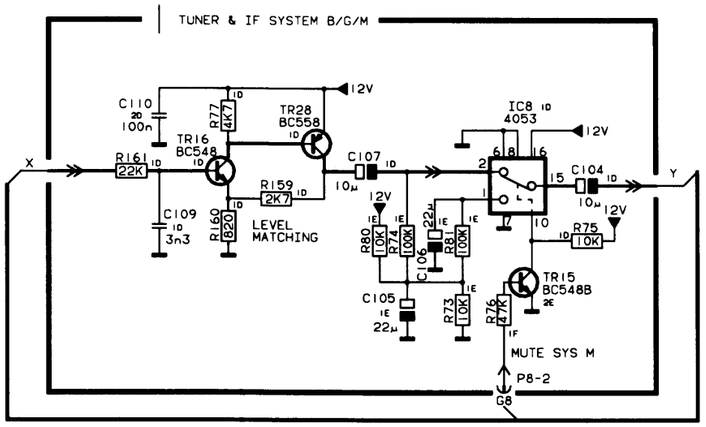
IF SOUND RIGHT

STROBE & TV SYSTEM INFO

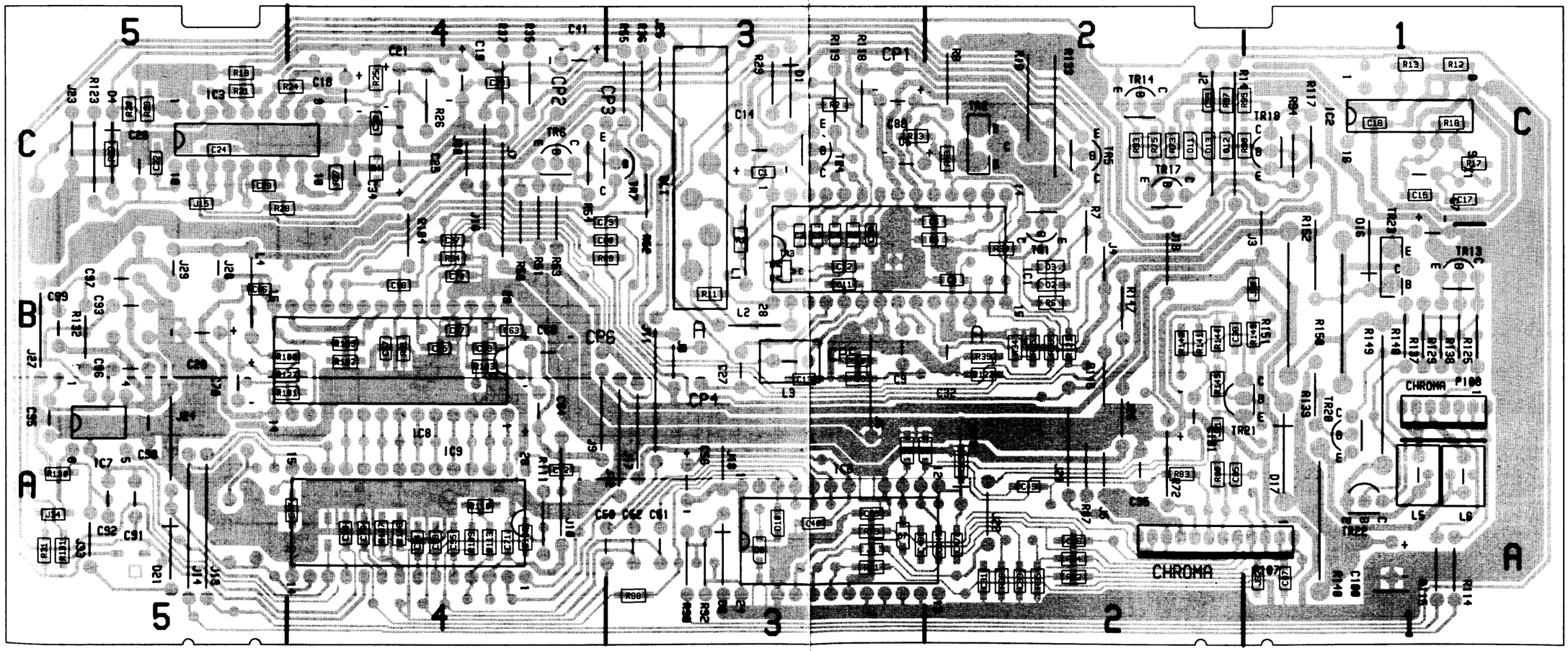
PRESET

■ IF THE TV IS NOT FITTED WITH NICAM PCB, P7 HAS CONNECTION TO P59 ON THE VIDEO & SOUND SWITCHING PCB

DIAGRAM TUNER & IF SYSTEM B/G/M



PCB 40

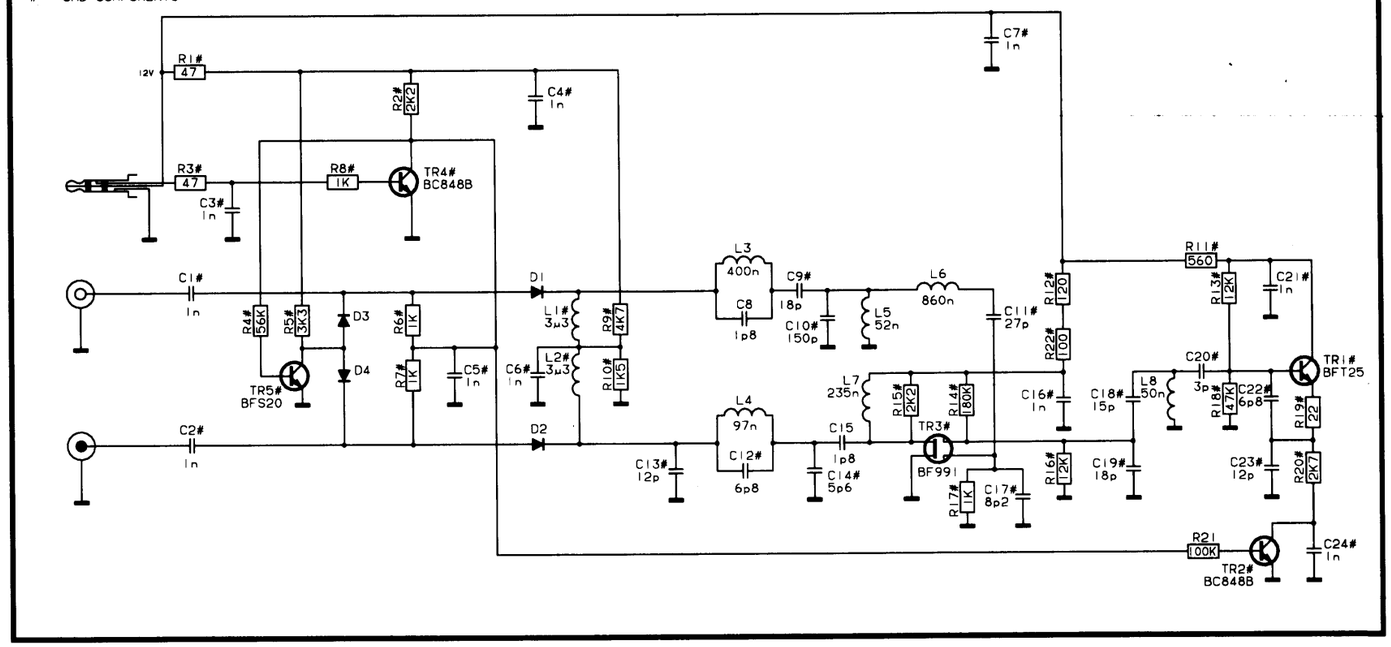


2-28
ACCESSORIES

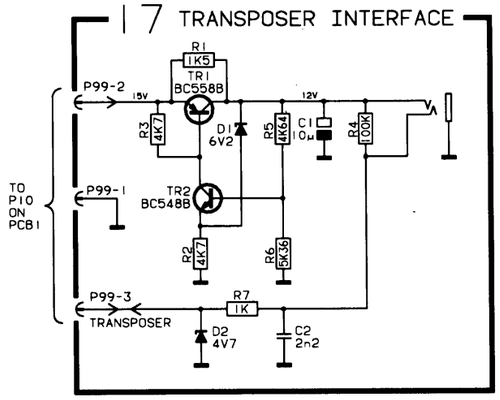
2-28

29 TRANSPOSER

= SMD COMPONENTS

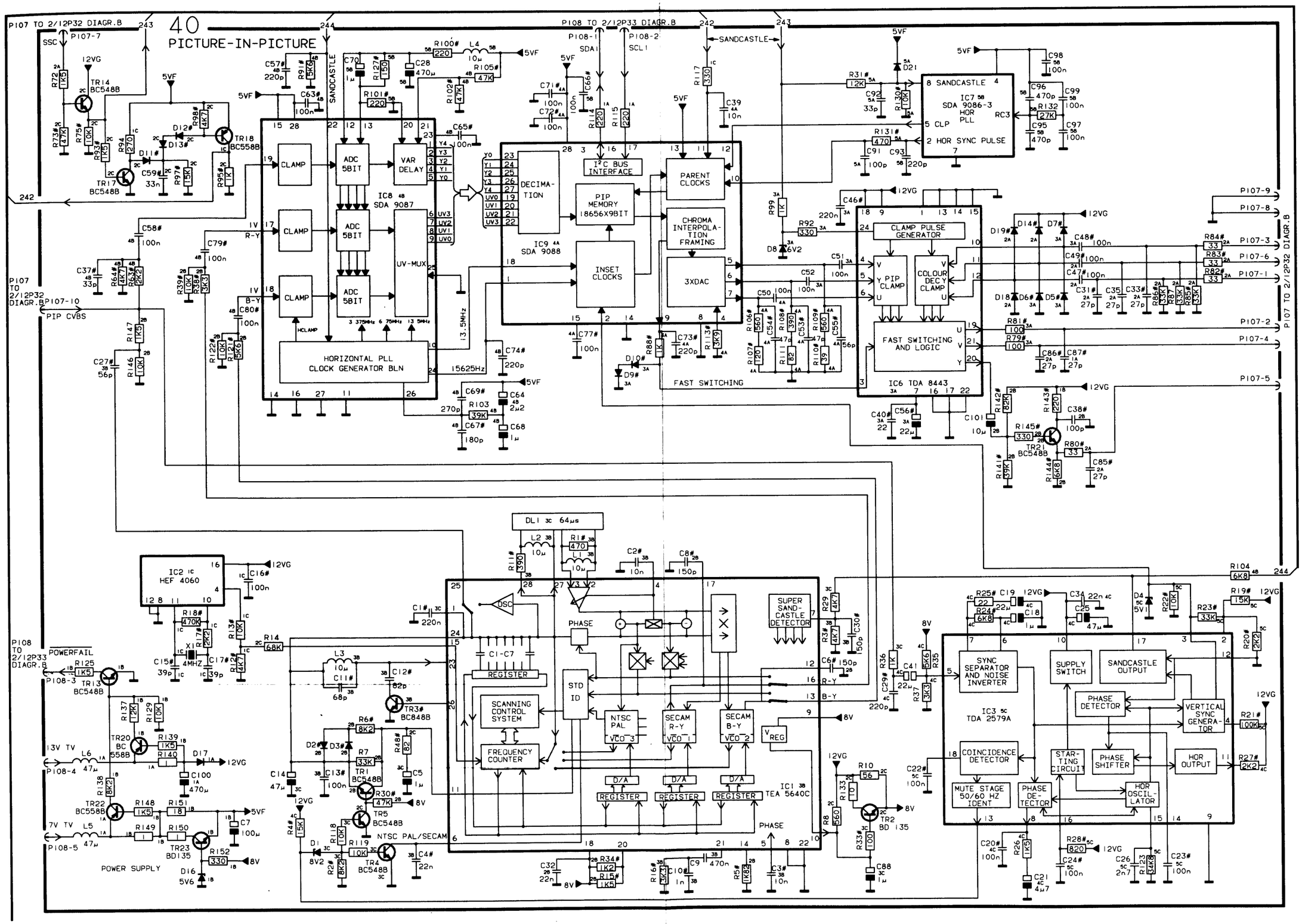


17 TRANSPOSER INTERFACE



2-30
ACCESSORIES

DIAGRAM PICTURE-IN-PICTURE

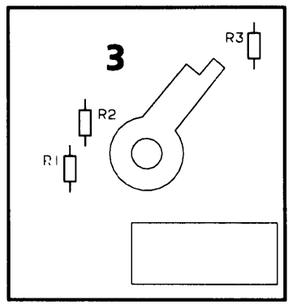


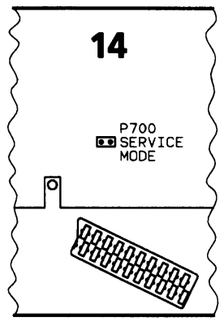
5-1

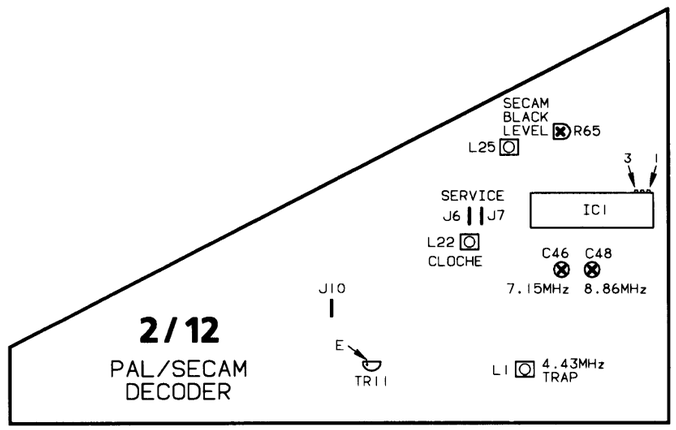
5-1

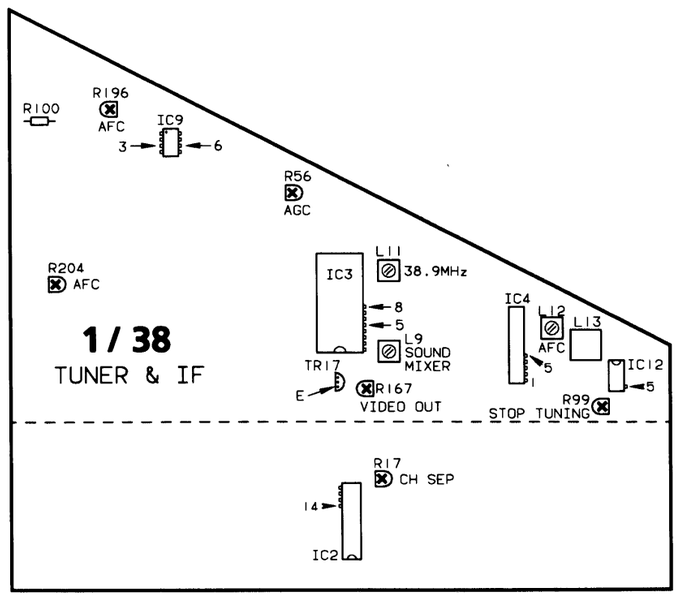
JUSTERINGER

ADJUSTMENTS









SERVICEJUSTERINGER MED BEOLINK 1000

Service mode

Bring TV'et i SERVICEMODE:
- Fjern bagparten.
- Tast [TV].
- Kortslut SERVICEMODE-stikket P700 på PCB14 kortvarigt.

SERVICEMODE giver mulighed for følgende servicejusteringer:
(For andre muligheder i servicemode se reparationstips).

Billedjusteringer:

Display		Reguleringsområde
Rdr	Red drive	0-63
Gdr	Green drive	0-63
Rcu	Red cut off balance	0-63
Gcu	Green cut off balance	0-63
BRI	BRIlliance preset	0-7
COL	COLour preset	0-7

Geometrijusteringer:

Display		Reguleringsområde
Hfq	Horizontal frequency	0-63
Hph	Horizontal phase	0-63
Ham	Horizontal amplitude	0-63
Vam	Vertical amplitude	0-63
Vsc	Vertical s correction	0-63
Vsh	Vertical shift (centering)	0-63
Vli	Vertical liniarity	0-63
EWc	EW corner	0-63
EWp	EW parabola	0-63
EWt	EW tilt	0-63

Reset

Indstil lys, farvemætning og kontrast til nominelle værdier:
- BRILLIANCE 32 [PICTURE] [^] [v]
- COLOUR 32 [PICTURE] [^] [v]
- CONTRAST 44 [PICTURE] [^] [v]

Gem værdierne i TV'et, [PICTURE] [STORE] [STORE] så de kan kaldes tilbage ved at taste [RESET] eller [SHIFT] [MUTE] Beolink 1000 MK III se side 7-7.

BETJENING I SERVICEMODE

[«] [»]	Step i menu
[<] [>]	eller
[▼] [▲]	Ændring af værdi
[STOP]	Ud af servicemode

Når SERVICEMODE forlades er de valgte værdier gemt.
Regulering af lyd- og billedflader med Beolink 1000 virker i SERVICEMODE.

Der anvendes normalt farvetestbillede til de efterfølgende justeringer.

SERVICE ADJUSTMENTS WITH BEOLINK 1000

Service mode

Bring the TV set into SERVICE MODE:
- Remove the rear panel.
- Press [TV].
- Short-circuit the SERVICE MODE plug, P700, on PCB14 briefly.

SERVICE MODE gives access to making the following service adjustments:
(For other options available in service mode, please see repair tips).

Picture adjustments:

Display		Adjustment range
Rdr	Red drive	0-63
Gdr	Green drive	0-63
Rcu	Red cut-off balance	0-63
Gcu	Green cut-off balance	0-63
BRI	BRIlliance preset	0-7
COL	COLour preset	0-7

Geometrical adjustments:

Display		Adjustment range
Hfq	Horizontal frequency	0-63
Hph	Horizontal phase	0-63
Ham	Horizontal amplitude	0-63
Vam	Vertical amplitude	0-63
Vsc	Vertical S-correction	0-63
Vsh	Vertical shift (centring)	0-63
Vli	Vertical linearity	0-63
EWc	EW corner	0-63
EWp	EW parabola	0-63
EWt	EW tilt	0-63

Reset

Set the brilliance, colour saturation and contrast to nominal values:
- BRILLIANCE 32 [PICTURE] [^] [v]
- COLOUR 32 [PICTURE] [^] [v]
- CONTRAST 44 [PICTURE] [^] [v]

Store the values in the TV set, [PICTURE] [STORE] [STORE], such that they may be recalled by pressing [RESET] or [SHIFT] [MUTE] Beolink 1000 MK III see page 7-7.

OPERATION IN SERVICE MODE

[«] [»]	Step in menu
[<] [>]	or
[▼] [▲]	Changing of value
[STOP]	Out of service mode

When you go out of SERVICE MODE, the selected values are stored.
User adjustment of sound and picture is possible with Beolink 1000 in SERVICE MODE.

A standard colour test pattern is used for the following adjustments.

Preset

Preset-justering (referenceniveau) af lys og farvemætning.
- Indstil lys og farvemætning til nominelle værdier [RESET] eller [SHIFT] [MUTE] Beolink 1000 MK III.
- Sæt TV'et i SERVICEMODE.
- Juster lys (BRI) til korrekt lysindhold i billedet (typisk 3).
- Juster farvemætning (COL) til korrekt farvemætning (typisk 4).

Cut-off balance
- Indstil lys til nominel værdi, [RESET] eller [SHIFT] [MUTE] Beolink 1000 MK III.
- Indstil farvemætning til '0'.
- Sæt TV'et i SERVICEMODE.
- Juster rød og grøn cut-off balance (Rcu) og (Gcu) til de mørke felter i testbilledet er farveløse.

Drive
- Indstil lys til nominel værdi, [RESET] eller [SHIFT] [MUTE] Beolink 1000 MK III.
- Indstil farvemætning til '0'.
- Sæt TV'et i SERVICEMODE.
- Juster rød og grøn drive (Rdr) og (Gdr) til korrekt hvidpunkt.

HORISONTAL AFBØJNING

Hor. frekvens
- Kortslut ben 5 på 13IC1 til stel.
- Vælg Hfq i SERVICEMODE.
- Juster hor. frekvens til langsomst horisontal billedrul.
- Fjern kortslutningen.

Øst/Vest parabel
- Vælg EWp i SERVICEMODE.
- Juster til korrekt geometri i siderne.

Øst/Vest tilt
- Vælg EWt i SERVICEMODE.
- Juster til korrekt geometri (vert. centrering påvirkes).

Øst/Vest corner
- Vælg EWc i SERVICEMODE.
- Juster til korrekt geometri i hjørnerne.

Hor. amplitude
- Vælg Ham i SERVICEMODE.
- Juster til korrekt amplitude.

Preset

Preset adjustment (reference level) of brilliance and colour saturation.
- Set the brilliance and colour saturation to nominal values, [RESET] or [SHIFT] [MUTE] Beolink 1000 MK III.
- Bring the TV set into SERVICE MODE.
- Adjust the brilliance (BRI) until the picture has the proper brilliance (typically 3).
- Adjust the colour saturation (COL) to the proper colour saturation (typically 4).

Cut-off balance
- Set the brilliance to the nominal value, [RESET] or [SHIFT] [MUTE] Beolink 1000 MK III.
- Set the colour saturation to '0'.
- Bring the TV set into SERVICE MODE.
- Adjust the red and green cut-off balance (Rcu) and (Gcu) until the dark fields in the test pattern are colourless.

Drive
- Set the brilliance to the nominal value, [RESET] or [SHIFT] [MUTE] Beolink 1000 MK III.
- Set the colour saturation to '0'.
- Bring the TV set into SERVICE MODE.
- Adjust the red and green drive (Rdr) and (Gdr) to the proper white level.

HORIZONTAL DEFLECTION

Horizontal frequency
- Short-circuit pin 5 of 13IC1 to ground.
- Select Hfq in SERVICE MODE.
- Adjust the horizontal frequency to the slowest possible picture roll.
- Remove the short circuit.

East/West parabola
- Select EWp in SERVICE MODE.
- Adjust to correct geometry at the sides.

East/West tilt
- Select EWt in SERVICE MODE.
- Adjust to correct geometry (vertical centring is affected).

East/West corner
- Select EWc in SERVICE MODE.
- Adjust to correct geometry in the corners.

Horizontal amplitude
- Select Ham in SERVICE MODE.
- Adjust to correct amplitude.

Hor. centrering/'phase'
- Indstil lys (BRILLIANCE) til maksimum.
- Vælg Ham i SERVICEMODE og juster til minimum bredde.
- Vælg Hph og centrer billedet så det ligger indenfor scan-tiden.
- Vælg Ham og juster til korrekt bredde.
- Centrer billedet bedst muligt med 3S1.
- Vælg Hph og efterjuster.
- Tryk [RESET] eller [SHIFT] [MUTE] (Beolink 1000 MK III) for at justere BRILLIANCE til nominel.

VERTIKAL AFBØJNING
Vert. amplitude
- Vælg Vam i SERVICEMODE.
- Juster til korrekt amplitude.

Vert. linearitet
- Vælg Vli i SERVICEMODE.
- Juster til korrekt linearitet.

Vert. S-korrektion
- Vælg Vsc i SERVICEMODE.
- Juster til korrekt geometri (øst/vest corner påvirkes).

Vert. centrering
- Vælg Vsh i SERVICEMODE.
- Juster til korrekt centrering (øst/vest tilt påvirkes).

Gentag evt. justeringsproceduren.

Horizontal centring/'phase'
- Set the BRILLIANCE to the maximum value.
- Select Ham in SERVICE MODE and adjust to minimum width.
- Select Hph and centre the picture such that it is within the scanning period.
- Select Ham and adjust to correct width.
- Centre the picture optimally by means of 3S1.
- Select Hph and readjust.
- Press [RESET] or [SHIFT] [MUTE] (Beolink 1000 MK III) to adjust the BRILLIANCE to its nominal value.

VERTICAL DEFLECTION
Vertical amplitude
- Select Vam in SERVICE MODE.
- Adjust to correct amplitude.

Vertical linearity
- Select Vli in SERVICE MODE.
- Adjust to correct linearity.

Vertical S-correction
- Select Vsc in SERVICE MODE.
- Adjust to correct geometry (East/West corner is affected).

Vertical centring
- Select Vsh in SERVICE MODE.
- Adjust to correct centring (East/West tilt is affected).

Repeat the adjustment procedure if required.

JUSTERINGSVEJLEDNING

Under de efterfølgende justeringer skal modtageren være tilsluttet et normalt farvetestbillede, hvis andet ikke er nævnt.
Servicejusteringer med terminal skal være foretaget.

Modul 2/12 PAL/SECAM/NTSC dekoder

Fokus

- Indstil lys og farvemætning til nominelle værdier, [RESET] eller [SHIFT] [MUTE] Beolink 1000 MK III.
- Indstil kontrasten til maksimum.
- Juster til optimal focusering set ca. 10 cm fra skærmkanten, med focuspotentiometeret på modul 3.

4,43 MHz cromasug

- Tilslut et PAL testbillede (farvebar)
- Slut et oscilloskop til 2/12J10 (koordinat 2C) eller emitter på 2/12TR11 (koordinat 2D).
- Juster 2/12L1 (koordinat 1D) til minimum 4,43 MHz-rest i signalet.

PLL ref. osc

- Tilslut et PAL testbillede (farvebar).
- Kortslut 2/12J6 og 2/12J7 (koordinat 2B).
- Juster 2/12C48 (koordinat 1C) til minimum farverul i farvebaren.

Hvis der er monteret PAL/NTSC B/G/M MF i TV'et, skal 2C46 også justeres.

- Juster 2C46 (koordinat 1C) på samme måde som 2C48. TV'et skal blot være tilsluttet et NTSC M testbillede.

Cloche filter

- Tilslut et SECAM testbillede (farvebar).
- Juster 2L22 (koordinat 2C) til bedst mulig farve-overgange i farvebaren.

Secam sort niveau

- Tilslut et SECAM farvetestbillede med sort indhold.
- Slut et oscilloskop til ben 1 på 2IC1.
- Juster 2R65 (koordinat 1B) til DC niveauet på signalet har samme DC niveau som blanking (sort niveau).
- Slut et oscilloskop til ben 3 på 2IC1.
- Juster 2L25 (koordinat 1B) til DC niveauet på signalet har samme DC niveau som blanking (sort niveau).
- Gentag justeringen.

ADJUSTMENT GUIDE

A standard colour test pattern must be connected when making the following adjustments unless otherwise specified.
Service adjustments with the remote control terminal must have been made in advance.

Module 2/12 PAL/SECAM/NTSC decoder

Focus

- Set the brilliance and colour saturation to their nominal values, [RESET] or [SHIFT] [MUTE] Beolink 1000 MK III.
- Set the contrast to the maximum value.
- Adjust to optimum focusing as viewed approx. 10 cm from the edge of the screen by means of the focus potentiometer on module 3.

4.43 MHz chroma trap

- Connect a PAL test pattern (colour bar).
- Connect an oscilloscope to 2/12J10 (coordinate 2C) or the emitter of 2/12TR11 (coordinate 2D).
- Adjust 2/12L1 (coordinate 1D) to obtain the minimum 4.43 MHz residue in the signal.

PLL ref. osc

- Connect a PAL test pattern (colour bar).
- Short-circuit 2/12J6 and 2/12J7 (coordinate 2B).
- Adjust 12C48 (coordinate 1C) to obtain the minimum colour roll in the colour bar.

If a PAL/NTSC B/G/M IF is installed in the TV set, 2C46 has to be adjusted, too.

- Adjust 2C46 (coordinate 1C) in the same way as 2C48. Only an NTSC M test pattern has to be connected to the TV set.

Cloche filter

- Connect a SECAM test pattern (colour bar).
- Adjust 2L22 (coordinate 2C) until the optimum colour graduations in the colour bar are achieved.

SECAM black level

- Connect a SECAM test pattern with black content.
- Connect an oscilloscope to pin 1 of 2IC1.
- Adjust 2R65 (coordinate 1B) until the DC level of the signal has the same DC level as blanking (black level).
- Connect an oscilloscope to pin 3 of 2IC1.
- Adjust 2L25 (coordinate 1B) until the DC level of the signal has the same DC level as blanking (black level).
- Repeat the adjustment.

Cut-off
- Indstil lys til nominel værdi, [RESET] eller [SHIFT] [MUTE] Beolink 1000 MK III.
- Tast [PICTURE] [MUTE].
- Mål med et DC voltmeter (Ri > 1MΩ) spændingsfaldet over 3R1, 3R2 og 3R3.
- Juster med G2-potentiometeret (modul 3), indtil der er 20V over den af 3R1, 3R2 eller 3R3, der har det mindste spændingsfald.
- Tast [PICTURE] [MUTE] efter justeringen.

Modul 1/38 Tuner & IF

AFC

Justeres kun hvis 1/38IC4 udskiftes.
- Kortslut 1/38R100 (koordinat 5F).
- Kortslut 1/38L13 (koordinat 3A).
- Slut et DC voltmeter til ben 5 på 1/38IC4 (koordinat 3B), og juster 1/38L12 (koordinat 3B) til der måles 6V.
- Drej 1/38R204 (koordinat 3F) helt mod uret.
- Tilslut DC voltmeter mellem ben 3 og ben 6 på 1/38IC9 (koordinat 4E), og juster 1/38R196 (koordinat 5E) til der måles 0,6V.
- Slut et DC voltmeter til ben 3 på 1/38IC9 (koordinat 4E), og juster 1/38R204 (koordinat 3F) til der måles 6,3V.
- Fjern kortslutningerne over 1/38R100 og 1/38L13.

Video carrier 38,9 MHz

Justeres kun hvis 1/38IC3 udskiftes.
- Slut et oscilloskop til ben 8 på 1/38IC3 (koordinat 3C).
- Juster 1/38L11 (koordinat 3C) til forreces på liniesynkpulsen er så vandret som muligt.

Stop tuning

Justeres kun hvis 1/38IC12 udskiftes.
- Fjern antennesignalet fra tuneren.
- Tilslut frekvenstæller til ben 5 på 1/38IC12 (koordinat 2A).
- Juster 1/38R99 (koordinat 2A) til der måles 15625 Hz.

AGC

Justeres kun hvis 1/38IC3 udskiftes.
- Tilslut et antennesignal B/G eller I.
- Drej 1/38R56 (koordinat 4D) helt med uret, derefter drejes der mod uret til billedet netop er støjfrit.

Video output
- Slut et oscilloskop til emitteren på 1/38TR17 (koordinat 2C).
- Juster 1/38R167 (koordinat 2C) til der måles 2Vpp.

Cut-off
- Set the brilliance to the nominal value, [RESET] or [SHIFT] [MUTE] Beolink 1000 MK III.
- Press [PICTURE] [MUTE].
- Use a voltmeter (Ri > 1MΩ) for measuring the voltage drop across 3R1, 3R2 and 3R3.
- Adjust by means of the G2 potentiometer (module 3) until there is a voltage of 20V across that resistor, 3R1, 3R2 or 3R3, which has the smallest voltage drop.
- Press [PICTURE] [MUTE] after completing the adjustment.

Module 1/38 Tuner & IF

AFC

To be adjusted only if 1/38IC4 is replaced.
- Short-circuit 1/38R100 (coordinate 5F).
- Short-circuit 1/38L13 (coordinate 3A).
- Connect a DC voltmeter to pin 5 of 1/38IC4 (coordinate 3B) and adjust 1/38L12 (coordinate 3B) until 6V is measured.
- Turn 1/38R204 (coordinate 3F) fully anticlockwise.
- Connect a DC voltmeter between pin 3 and pin 6 of 1/38IC9 (coordinate 4E) and adjust 1/38R196 (coordinate 5E) until 0.6V is measured.
- Connect a DC voltmeter to pin 3 of 1/38IC9 (coordinate 4E) and adjust 1/38R204 (coordinate 3F) until 6.3V is measured.
- Remove the short circuits across 1/38R100 and 1/38L13.

Video carrier 38.9 MHz

To be adjusted only if 1/38IC3 is replaced.
- Connect an oscilloscope to pin 8 of 1/38IC3 (coordinate 3C).
- Adjust 1/38L11 (coordinate 3C) until the front porch of the line sync pulse is as horizontal as possible.

Stop tuning

To be adjusted only if 1/38IC12 is replaced.
- Remove the aerial signal from the tuner.
- Connect a frequency counter to pin 5 of 1/38IC12 (coordinate 2A).
- Adjust 1/38R99 (coordinate 2A) until 15625 Hz is measured.

AGC

To be adjusted only if 1/38IC3 is replaced.
- Connect an aerial signal B/G or I.
- Turn 1/38R56 (coordinate 4D) fully clockwise, then turn it anticlockwise until the picture is just free of noise.

Video output
- Connect an oscilloscope to the emitter of 1/38TR17 (coordinate 2C).
- Adjust 1/38R167 (coordinate 2C) until 2Vpp is measured.

Sound mixer

Justeres kun hvis 1/38IC3 udskiftes.
- Slut et oscilloskop til ben 5 på 1/38IC3 (koordinat 3C) (x = 1µs).
- Juster 1/38L9 (koordinat 3C) indtil top og bund af signalet er så parallelle som muligt.

Kanalseparation
- Tilslut et antennesignal med A2 stereo lydmodulation.
- Slut et oscilloskop til ben 14 på 1/38IC2 (koordinat 1C).
- Juster 1/38R17 (koordinat 1C) til minimal overhøring.

NICAM system B/G og I
- Tilslut et NICAM antennesignal B/G eller I.
- Tilslut et oscilloskop, der kan lave x-y afbøjning til 8L1 og 8L2 på den side der vender ind mod 8C59 (koordinat 1A).
- Juster 8C34 (koordinat 1B) indtil oscilloskopbilledet herunder er opnået. (VCO frekvensen er 5,85MHz for system B/G og 6,552MHz for system I).

x = y = 0,2 V/DIV

Sound mixer

To be adjusted only if 1/38IC3 is replaced.
- Connect an oscilloscope to pin 5 of 1/38IC3 (coordinate 3C) (x = 1µs).
- Adjust 1/38L9 (coordinate 3C) until the top and bottom of the signal are as parallel as possible.

Channel separation
- Connect an aerial signal with A2 stereo sound modulation.
- Connect an oscilloscope to pin 14 of 1/38IC2 (coordinate 1C).
- Adjust 1/38R17 (coordinate 1C) to minimum crosstalk.

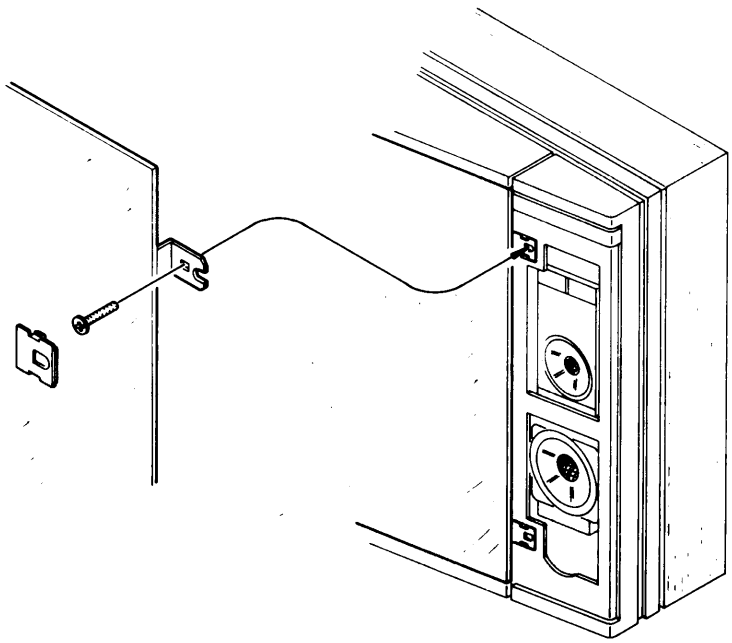
NICAM systems B/G and I
- Connect a NICAM aerial signal B/G or I.
- Connect an oscilloscope that is able to produce an x-y deflection to 8L1 and 8L2 on the side facing towards 8C59 (coordinate 1A).
- Adjust 8C34 (coordinate 1B) until the oscilloscope image shown below has been achieved. (The VCO frequency is 5.85 MHz for system B/G and 6.552 MHz for system I).

x = y = 0.2 V/DIV

Bang&Olufsen

ADSKILLELSE
LX5000/6000
Kontrastskærm

DISASSEMBLY
LX5000/6000
Contrast screen



Rammen med højttalerstof fjernes ved først at trække forsigtigt ud for neden, dernæst i midten og til sidst foroven.

De fire dæksler, to i hver side, aftages med en lille flad skruetrækker.

Skruerne som holder skærmen er nu tilgængelige.

Afmonter de to nederste skruer og ***kun*** en foroven.

Hold godt fast på skærmen medens den sidste skrue fjernes.

Remove frame with loudspeaker cloth by first pulling carfully from the bottom, then in the middle and finally from the top.

Remove the four caps, two in each side, using a small flat screw driver.

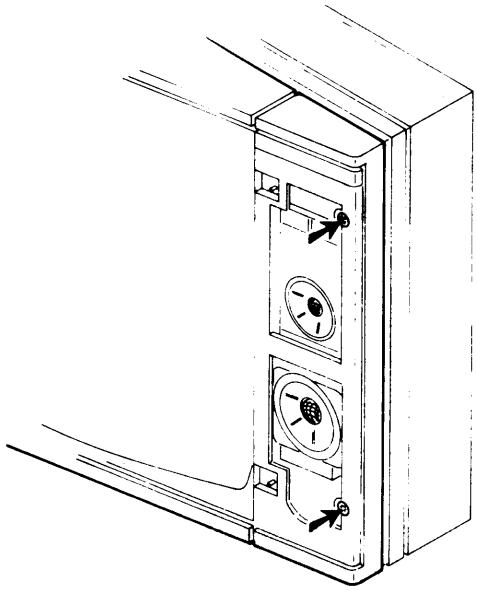
The screws which hold the screen are now accessible.

Remove the two bottom screws and *one* from the top.

Hold tightly on to the screen while removing the last screw.

Frontramme
(Adgang til IR modtager)

Front frame
(Access to IR receiver)



Kontrastskærmen afmonteres.

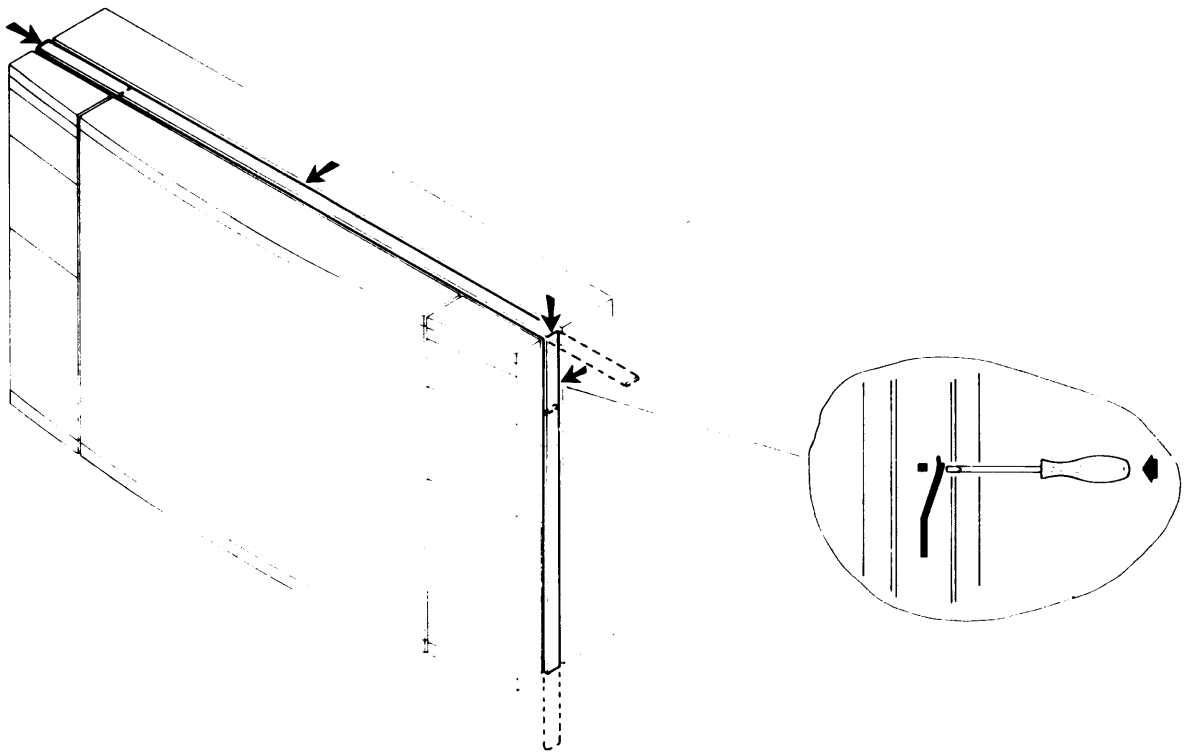
De to viste skruer og de to tilsvarende i den anden side skrues af, og frontrammen kan aftages.

Remove the contrast screen.

Unscrew the two screws illustrated as well the two corresponding screws in the other side, and take of the front frame.

Topliste/Sideliste

Top list/Side list



Sidelisterne løsnes ved at udløse låsen med en smal skruetrækker.

Når låsen er udløst kan sidelisten skubbes ned.

Toplisten løsnes som sidelisterne.

Toplisten skubbes mod højre.

Loosen side lists by releasing lock using a small screwdriver.

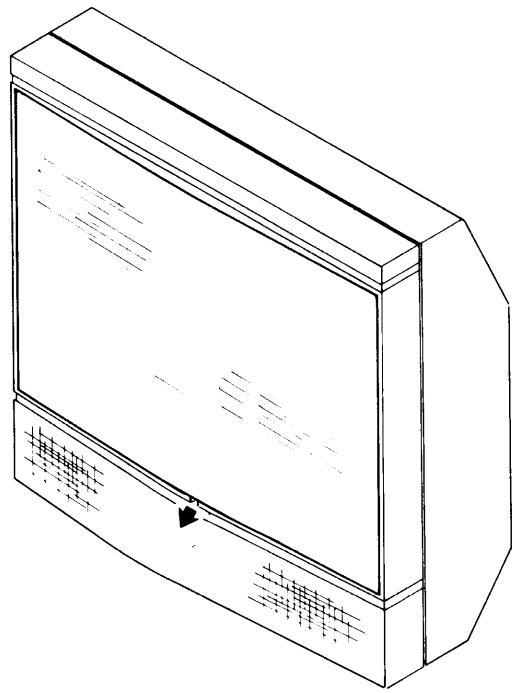
Now the side list may be pushed down.

Loosen top list like the side lists.

Push top list towards the right.

ADSKILLELSE
MX4000
Demontering af kontrastskærmen

DISASSEMBLY
MX4000
Removal of contrast screen

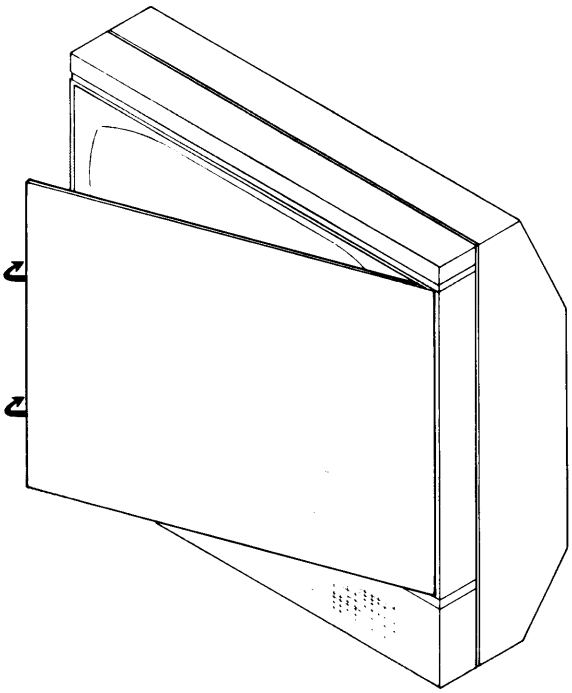


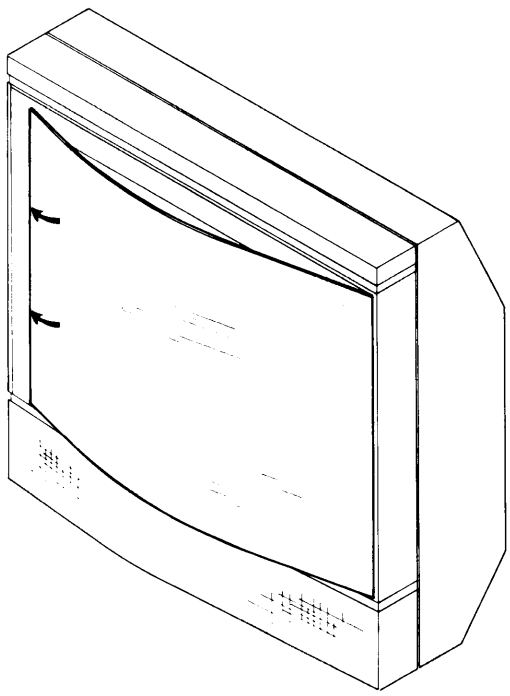
Træk ud i kontrastskærmens nederste kant.

Pull the lower edge of the contrast screen outwards.

Montering af kontrastskærmen

Mounting of contrast screen





Monter skærmen i rillen af det ene sidepanel.

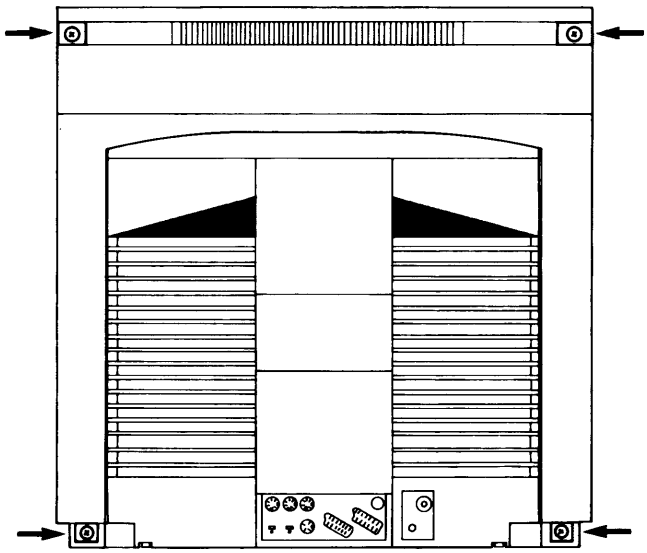
Bøj skærmen frem og monter skærmen i rillen af det modsatte sidepanel.

Fit the screen into the groove in one of the side panels.

Flex the screen slightly outwards and fit the screen into the groove in the opposite side panel.

Bagpart

Rear part

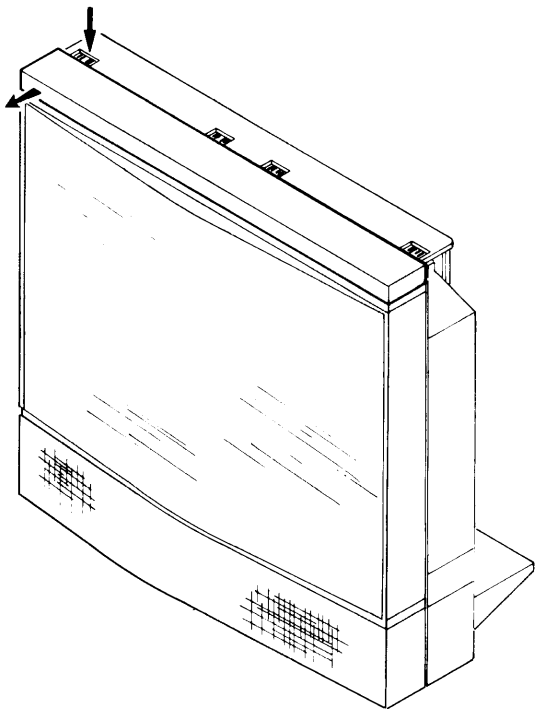


De fire skruer løsnes, og bagparten trækkes lige bagud.

Loosen the 4 screws and then remove the rear part by pulling straight outwards.

Toppanel

Top panel



Panelet løsnes i den ene side, ved at låsen aktiveres med en skruetrækker.

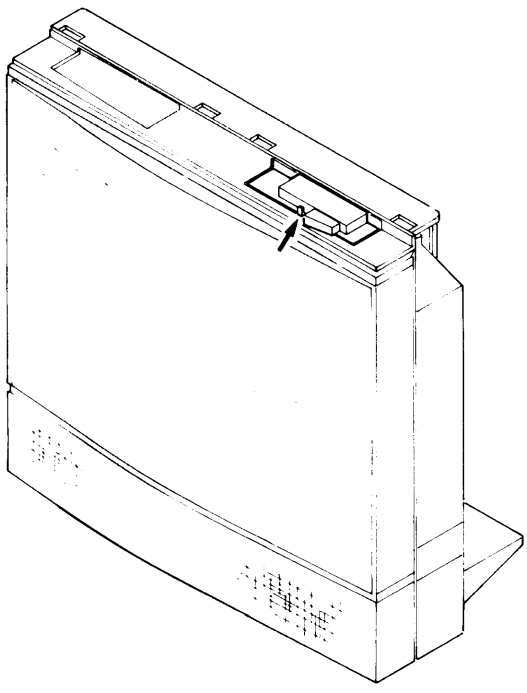
Toppanelet kan nu fjernes.

Loosen the panel in one side by releasing the lock with a screwdriver.

The top panel can now be removed.

PCB 9 IR Transceiver

PCB 9 IR Transceiver

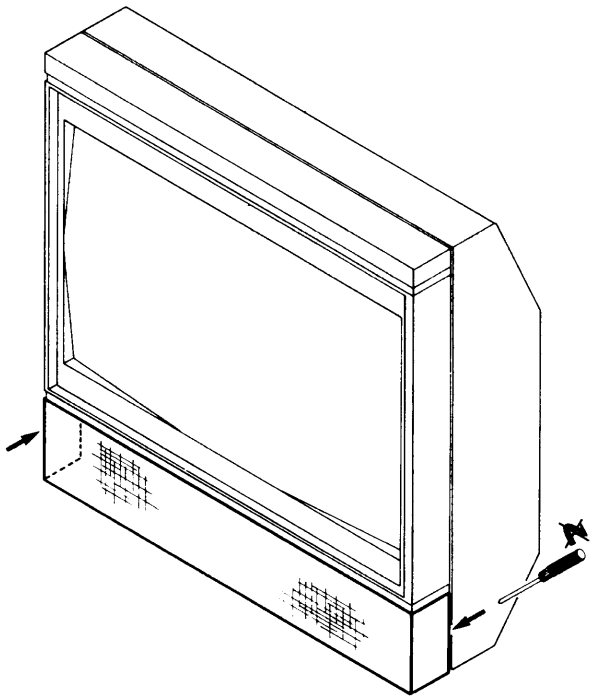


Låsen løsnes og PCB'en tages ud, ved at løfte i den forreste kant.

Release the lock and remove the PCB by lifting it at its front.

Højttalerpanel

Loudspeaker panel



En skruetrækker sættes forsigtigt ind mellem højttalerpanelet og kabinettet i apparatets højre side.

Højttalerpanelet løsnes med et let tryk med skruetrækkeren og skubbes dernæst mod venstre.

Med et let tryk mod højttalerpanelets venstre hjørne frigøres panelet fuldstændig.

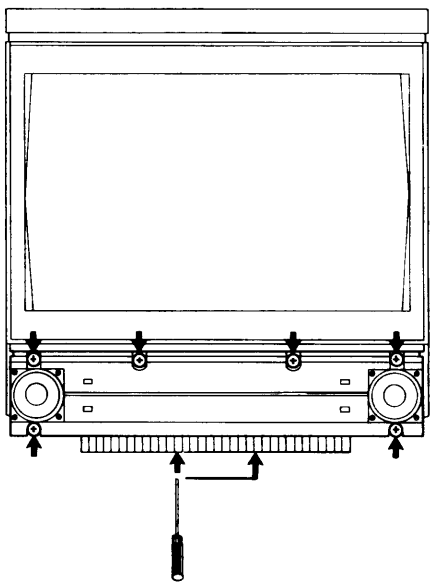
Carefully insert a screwdriver between the loudspeaker panel and the cabinet in the right-hand side of the set.

Loosen the loudspeaker panel by exerting a light pressure with the screwdriver.
Push the loudspeaker panel towards the left.

A light push against the left corner of the loudspeaker panel will now release the panel completely.

Højtalerbaffel

Loudspeaker baffle



De seks skruer fjernes.

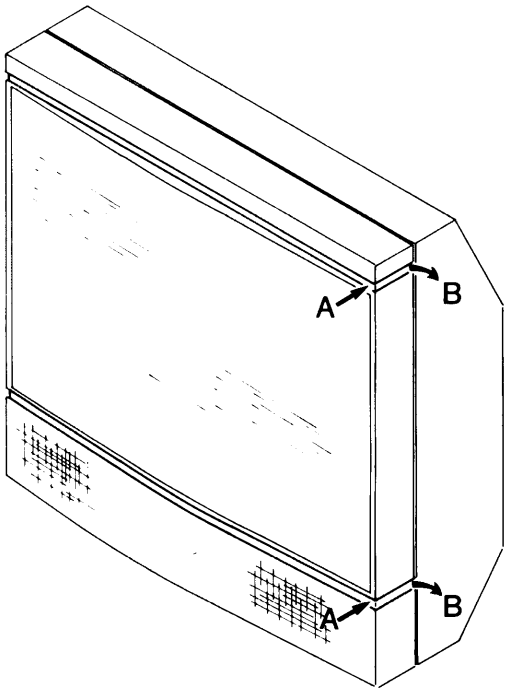
Højttalerbafflen løsnes, ved at de to låse i bunden af apparatet aktiveres, hvorefter bafflen trækkes fremad og opad.

Remove the 6 screws.

Loosen the loudspeaker baffle by using a screwdriver to release the 2 locks at the base of the set. Then pull the baffle outwards and upwards.

ADSKILLELSE
MX6000
Demontering af kontrastskærmen

DISASSEMBLY
MX6000
Removal of contrast screen



Pyntelisterne over og under kontrastskærmen løsnes ved at trykke listen ind (A) og samtidig trække ud i pilen B's retning. Listerne kan nu frigøres hele vejen rundt.

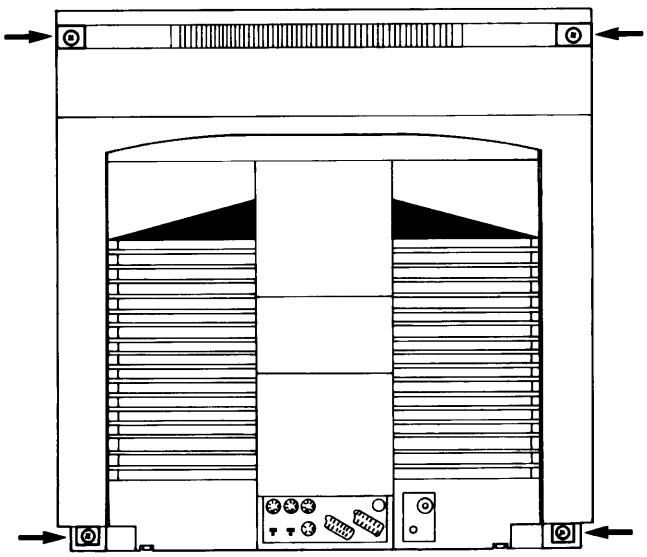
I hvert af de fire hjørner sidder en skrue som skrues ud, hvorefter kontrastskærmen er fri.

Loosen the upper and lower plastic strips by firmly pressing the strips in one side (A) and simultaneously pulling at the end of the strips in the direction of the arrow B. The strips are now loose and can be removed.

Loosen the screw in each of the four corners. The contrast screen can now be removed.

Bagpart

Rear part

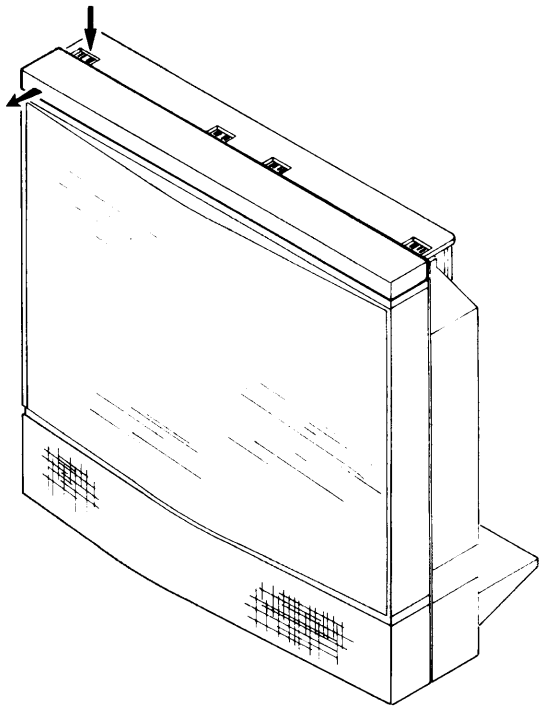


De fire skruer løsnes, og bagparten trækkes lige bagud.

Loosen the four screws and then remove the rear part by pulling straight outwards.

Toppanel

Top panel



Panelet løsnes i den ene side, ved at låsen aktiveres med en skruetrækker.

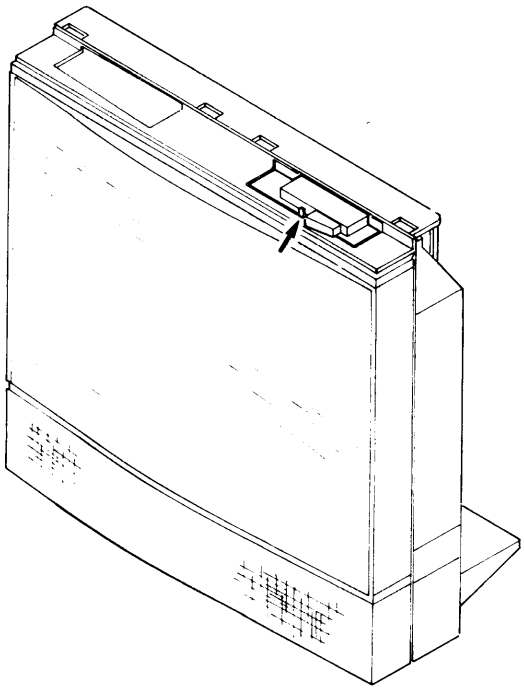
Toppanelet kan nu fjernes.

Loosen the panel in one side by releasing the lock with a screwdriver.

The top panel can now be removed.

PCB 9 IR Transceiver

PCB 9 IR Transceiver



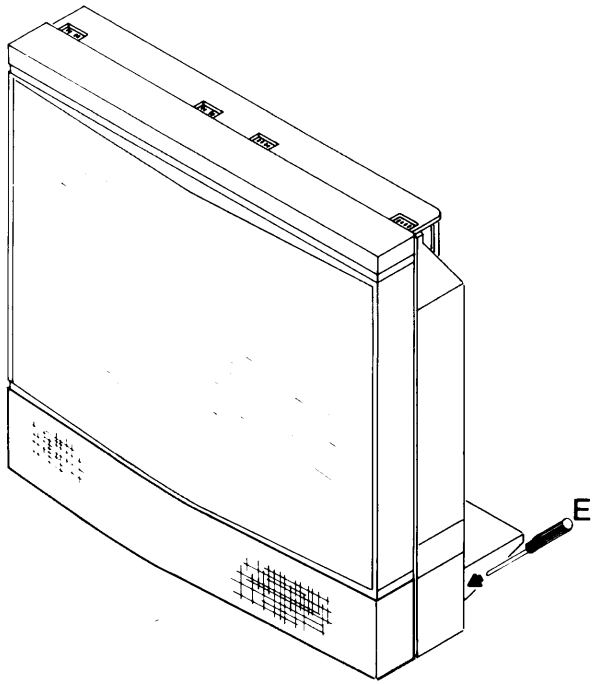
Låsen løsnes og PCB'en tages ud, ved at løfte i den forreste kant.

Release the lock and remove the PCB by lifting it at its front.

Bang&Olufsen

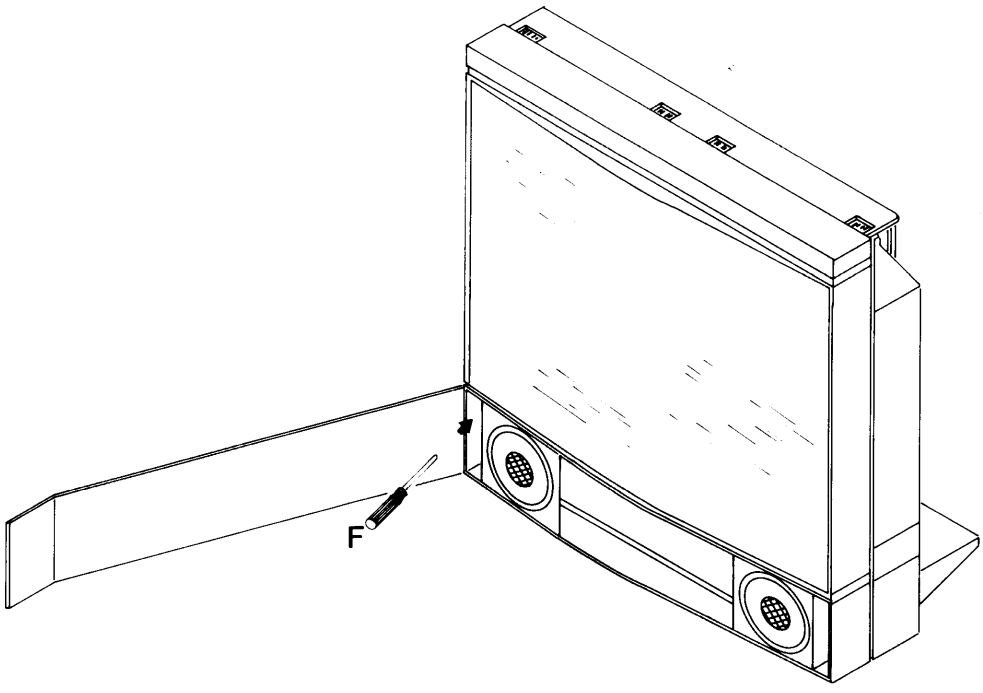
Højttalerpanel

Loudspeaker panel



Panelet frigøres i venstre side (set bagfra) ved at løsne låsene med en skruetrækker igennem hullerne i kabinettet (E). Herefter trækkes panelet fri langs kanten.

Loosen the panel in the left-hand side (seen from behind) by inserting a screwdriver into the holes in the cabinet (E) to release the locks. Loosen the panel at the front of the set.



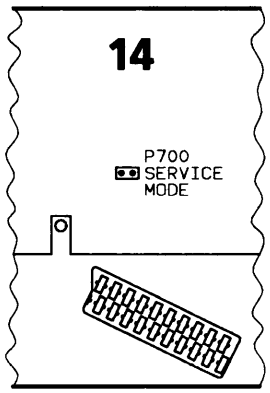
Panelet frigøres i den anden side ved at løsne låsene forfra med en skruetrækker mellem panelet og kabinettet (F).

To detach the panel in the opposite side, release the locks by inserting a screwdriver between the panel and the cabinet (F).

REPARATIONSTIPS

Service mode

Bring TV'et i SERVICEMODE:
- fjern bagparten
- tast [TV]
- kortslut SERVICEMODE-stikket P700 på PCB14 kortvarigt.



Service mode giver mulighed for:
Billed- og geometrijusteringer, se afsnittet SERVICEJUSTERINGER MED BEOLINK 1000.

Udlæsning af apparatets type- og serienummer

4200	00000001	Last error no
Type nummer	Serie nummer	Sidste fejltilstand

Billedrør

Der anvendes 2 forskellige billedrørstyper i TV'et, en Philips type og en Videocolour type.
De 2 billedrørstyper kræver forskellig billed mute tid under opstart.
Philips 7-8 sekunder.
Videocolour 11-12 sekunder.

7-8 eller 11-12 sekunder kan vælges i SERVICEMODE:
- Vælg Rdr i SERVICEMODE med [«] eller [»].
- Tast [8] for 7-8 sekunder (Philips).
- Tast [9] for 11-12 sekunder (Videocolour).

Som kvittering for at kommandoen er modtaget, går TV'et ud af SERVICEMODE.

Last error

Giver mulighed for udlæsning en evt. sidste fejltilstand.

TV'et er forsynet med en række sikringskredsløb, der træder i kraft ved fejl i apparatet og beskytter apparatet mod følgeskader.

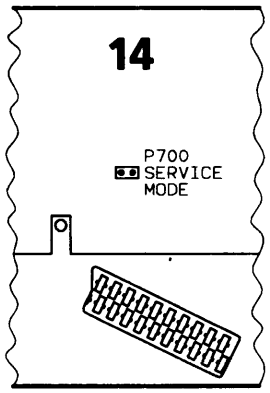
Følgende tre fejltyper overvåges.

- Power fail (f.eks. overbelastning af en forsyningsspænding).
- I^2C-bus fejl
- Fejl i EEPROM

REPAIR TIPS

Service mode

Bring the TV set into SERVICE MODE:
- remove the rear panel
- press [TV]
- short-circuit the SERVICE MODE plug, P700, on PCB14 briefly.



The service mode gives access to the following:
Picture and geometry adjustments, see the section SERVICE ADJUSTMENTS WITH BEOLINK 1000.

Display of the type and serial numbers of the TV set

4200	00000001	Last error no
Type number	Serial number	Last error condition

Picture tube

Two types of picture tubes are used in the TV, a Philips and a Videocolour type.
The two types require different picture mute time during start-up.
Philips 7-8 seconds.
Videocolour 11-12 seconds.

7-8 or 11-12 seconds can be selected in SERVICEMODE:
- Select Rdr in SERVICEMODE using [«] or [»]
- Press [8] for 7-8 seconds (Philips).
- Press [9] for 11-12 seconds (Videocolour).

As a sign of receipt of the command the TV leaves SERVICEMODE.

Last error

Permits the display of any last error condition.

The TV set is equipped with a number of safety circuits which become active in the event of an error occurring in the TV set and protect the set against damage as a consequence of such an error.

The following three error types are monitored:

- Power fail (e.g. overloading of a supply voltage).
- I^2C bus error.
- Error in EEPROM.

Udlæsning

Last error no = ingen fejl registreret.
Last error pf = power fail.
Last error 00 til og med FF = fejl et sted på I^2C-bussen.
Last error df = data failure (EEPROM 6IC6 evt. defekt).

Power fail kredsløbet er et ringkoblet system, der detekterer om en eller flere spændingsstabiliseringer er overbelastede. I givet fald registreres dette af µC'en, der bringer apparatet i stand-by.
Kredsløbet fungerer ved, at µC'en 6IC2 sender en pulserende spænding ud på ben 10.
Hvis der ikke er fejl, modtager µC'en signalet igen på ben 12 6IC4.
Hvis der opstår en overbelastning, clamper den overbelastede forsyning signalet, og der kommer ikke noget retur til ben 12.

Det samme signal styrer desuden netdelen ON via 4C62, 4R84 og 4TR19.
Hvis der opstår en fejl så netdelen ikke får tilført den pulserende spænding, går netdelen automatisk i stand-by.

Ved opstart ignoreres power fail retur meldingen i 400mS for at de forskellige spændingsstabiliseringer kan nå at regulere på plads. I de 400mS kan man evt. måle hvor den pulserende spænding bliver belastet i power fail systemet (se power fail diagram side 2-20).

I^2C-bus fejlsystemet er en del af softwaren, der registrerer kommunikationsfejl mellem µC'en og de komponenter, der styres via I^2C-bussen.
Hvis der opstår en sådan fejl, bringer µC'en apparatet i stand-by.

Hvis der opstår fejl i EEPROM (6IC6), så det ikke er muligt at overføre apparatets grundindstillinger til afbøjningsdelen og farvedelen, erstatter µC'en de manglende data med standardværdier, der er gemt i programlageret.

Opstart med ignorering af fejl:
Ved power fail eller I^2C-bus fejl, hvor TV'et går i stand-by hver gang det forsøges startet, er det muligt at starte TV'et op i en tilstand hvor fejlen ignoreres.

Fremgangsmåden er som følger:
- TV'et skal være i stand-by.
- Kortslut SERVICEMODE-stikket P700 på PCB14, kortslutningen skal være konstant.
- Hvis TV'ets stand-by/ON LED lyser orange er fejlen en power fail. Lyser LED'en rød er der tale om en data failure eller I^2C-bus fejl.
- Tryk [TV]. LED'en lyser nu grøn.

Display

Last error no = no error registered.
Last error pf = power fail.
Last error 00 up to and including FF = error somewhere on the I^2C bus.
Last error df = data failure (EEPROM 6IC6 perhaps defective).

The power fail circuit is a ring coupled system that detects whether or not one or several voltage stabilizations are overloaded. If that is the case, this is registered by the µC, which brings the TV set into stand-by.
The circuit operates as follows:
The µC, 6IC2, outputs a pulsating voltage at pin 10.
If there are no errors, the µC receives the signal back again at pin 12 6IC4.
If an overload condition occurs, the overloaded supply clamps the signal, and no signal is returned to pin 12.

The same signal, via 4C62, 4R84 and 4TR19, further causes the power-supply unit to switch ON.
If an error occurs such that the power-supply unit does not receive the pulsating voltage, the power-supply unit automatically goes into stand-by.

At power-up, the power fail return information is ignored for 400mS in order that the various power stabilizations may have time to adjust. During the 400mS period it is possible to measure e.g. where the pulsating voltage is loaded in the power fail system (see the power fail diagram on page 2-20).

The I^2C bus error system is integrated in the software that registers communication errors between the µC and the components which are controlled through the I^2C bus.
If such an error occurs, the µC brings the TV set into stand-by.

If an error occurs in the EEPROM (6IC6), such that it is not possible to transfer the basic settings of the TV set to the deflection section and the colour section, the µC replaces the missing data with standard values stored in the program memory.

Power-up with errors being ignored:
If a power fail or an I^2C bus error occur, which make the TV set go into stand-by every time it is attempted to be started, it is possible to start up the TV set in a mode in which the error is ignored.

The procedure is as follows:
- The TV set must be in stand-by.
- Short-circuit the SERVICE MODE plug, P700, on PCB14; the short circuit must be constant.
- If the stand-by/ON LED on the TV set emits orange light, the error is a power fail. If the LED emits red light, the error in question is a data failure or an I^2C bus error.
- Press [TV]. The LED will now emit green light.

- Fjern kortslutningen på SERVICEMODE-stikket. TV'et starter nu op i SERVICEMODE, såfremt det er muligt.

TV'et er nu i SERVICEMODE, men power fail og I²C-bus fejl bliver ignoreret, indtil TV'et næste gang har været i stand-by.

VIGTIGT! Hvis TV'et startes op med ignorering af power fail kan det medføre store ødelæggelser i apparatet (stand-by/ON led lyser orange).

I²C-bus fejl

En I²C-bus fejl betyder, at kommunikationen på bussen svigtede, da µC'en forsøgte at kommunikere med den pågældende adresse. I de fleste tilfælde betyder det, at tilhørende komponent er defekt. Fejlen kan dog også skyldes en anden komponent, der ødelagde kommunikationen netop, som der blev kommunikeret med adressen, der står som Last error.

Adresser ved I²C-bus fejl:
Last error 4E 1/38IC6, Tuner & IF port expander.
84 1/38IC2, A2 stereo decoder.
40 8IC3, NICAM port expander.
42 2/12IC5, D/A converter til CUT-OFF og DRIVE
22 37IC2, Teletext controller.
8C 13IC2, Afbøjnings controller.
82 14IC1, Lyd controller.
86 14IC9, Video omskifter.

Efter reparation af en fejl, der har været angivet med en fejlmeddelelse, skal fejlmeddelelsen rettes til Last error no. Dette gøres ved at taste [<] eller [>] ([▲] eller [▼]).

Udlæsning af software versions nr:
TV'et skal ikke være i SERVICEMODE.
Tast [TV] [MENU] [0] [0] [PLAY] eller [TV] [SHIFT] [TEXT] [0] [0] [PLAY].

Fejlfinding i AFC kredsløb

Fejl i AFC kredsløbene på Tuner & IF PCB1/38 vil typisk medføre, at tuningssystemet søger ned i bunden eller op i toppen af tuningsområdet, eller TV'et vil ikke fange den rigtige frekvens, når man forsøger at tune til en frekvens.

Følgende retningslinier kan bruges ved fejlfinding:
- Tilslut antennesignal.
- Kortslut 1/38R100 (koordinat 5F).
- Kortslut 1/38L13 (koordinat 3A). AFC'en er nu inaktiveret.
- Tryk [GOTO] [XXX] for at tune til en frekvens.
- Tryk [GOTO] en gang til og kontroller at FINE TUNE står i midten.

- Remove the short circuit from the SERVICE MODE plug. The TV set will now start up in SERVICE MODE if that is possible.

The TV is now in SERVICE MODE but power fail and I²C bus errors will be ignored until the next time the TV has been in stand-by mode.

IMPORTANT! If the TV is started up ignoring the power fail error it may result in serious damage to the TV (the stand-by/ON LED emits orange light).

I²C bus error:

An I²C bus error means that the communication on the bus failed when the µC tried to communicate with the address in question. In most cases this means that the ancillary component is defective. However, the error may also be caused by a different component which destroyed the communication just when the communication was taking place with the address listed as the Last Error.

Addresses in connection with I²C bus errors:
Last error 4E 1/38IC6, Tuner & IF port expander.
84 1/38IC2, A2 stereo decoder.
40 8IC3, NICAM port expander.
42 2/12IC5, D/A converter for CUT-OFF and DRIVE.
22 37IC2, Teletext controller.
8C 13IC2, Deflection controller.
82 14IC1, Audio controller.
86 14IC9, Video controller.

After the repair of an error which has been listed as an error message in the error display, the error message must the corrected to read Last error no. This is accomplished by pressing [<] or [>] ([▲] or [▼]).

Display of the software version number:
The TV set should not be in SERVICE MODE.
Press [TV] [MENU] [0] [0] [PLAY] or [TV] [SHIFT] [TEXT] [0] [0] [PLAY].

Fault-finding in AFC circuits

Faults in the AFC circuits on Tuner & IF PCB1/38 will typically result in the tuning system searching down to the bottom or up to the top of the tuning range, or the TV will be unable to catch the right frequency when trying to tune in to a frequency.

The following guidelines may be employed in connection with fault-finding:
- Connect the aerial signal.
- Short-circuit 1/38R100 (coordinate 5F).
- Short-circuit 1/38L13 (coordinate 3A). The AFC has now been made inactive.
- Press [GOTO] [XXX] to tune in to a frequency.
- Press [GOTO] once more and check that FINE TUNE stands at the centre.

- Tilslut DC voltmeter til ben 5 på 1/38IC9 (koordinat 4E), spændingen på ben 5 skal være 6 ±0,3V. Hvis spændingen ikke er rigtig, ligger fejlen i 1/38IC4 eller omliggende komponenter.
- Hvis de 6V på ben 5 er ok, tilslut DC voltmeter til ben 3 på 1/38IC9, spændinden på ben 3 skal være større end 6V.
- Tilslut DC voltmeter til ben 6 på 1/38IC9, spændingen på ben 6 skal være mindre end 6V.
- Hvis spændingerne på ben 3 og 6 ikke er ok, ligger fejlen i 1/38IC9, 1/38IC13 eller omliggende komponenter.

Fejlfinding i switch mode power supply

Ved fejl i switch mode power supply på PCB4, power supply & deflection, hvor f.eks. TR1, BUT 12 hele tiden bliver defekt, kan følgende retningslinier bruges ved fejlfinding:

- Afbryd netspændingen og tag chassiset ud.
- Kortslut basis-emitter på TR7 (R26), fig. 1.
- Lod en 1kohm modstand på midtpunktet for R24 og R25, fig. 1.
- Lod en 1kohm modstand på katoden af D16.
- Lod en ledning på anoden af D10 og slut ledningen til – bøsningen på en 5V DC strømforsyning, fig. 1.
- Lod en ledning på katoden af D12, lod den frie ende på de to 1kohm modstande fast på ledningen og slut ledningen til + bøsningen på en 5V DC strømforsyning, fig. 1.
- Slut midtpunktet på den balancerede ±5V DC strømforsyning til J16 (stel), fig. 1 og tænd strømforsyningen.
- Slut et oscilloskop til punkterne ①, ②, ③ og ④, fig. 1 og 2.
- Når de målte pulser er som oscilloskopbillederne ①, ②, ③ og ④, fig. 1 og 2, er switch mode power supply iorden.

- Connect a DC voltmeter to pin 5 of 1/38IC9 (coordinate 4E). The voltage at pin 5 should be 6 ±0.3V. If that voltage is not correct, the fault is in 1/38IC4 or the components surrounding it.
- If the 6V at pin 5 is OK, connect a DC voltmeter to pin 3 of 1/38IC9. The voltage at pin 3 should be greater than 6V.
- Connect a DC voltmeter to pin 6 of 1/38IC9. The voltage at pin 6 should be less than 6V.
- If the voltages at pins 3 and 6 are not OK, the fault is in 1/38IC9, 1/38IC13 or the surrounding components.

Fault-finding in switch mode power supply

If faults occur in the switch mode power supply on PCB4, power supply & deflection, e.g. if TR1, BUT 12 become defective all the time, the following guidelines may be employed in connection with the fault-finding process:

- Disconnect the mains voltage and take out the chassis.
- Short-circuit the base-emitter of TR7 (R26), fig. 1.
- Solder a 1 kohm resistor to the connection between R24 and R25, fig. 1.
- Solder a 1kohm resistor to the cathode of D16.
- Solder a lead to the anode of D10 and connect the lead to the – socket of a 5V DC power supply, fig. 1.
- Solder a lead to the cathode of D12, solder the free end of the two 1kohm resistors to the lead, and connect the lead to the + socket of the 5V DC power supply, fig. 1.
- Connect the mid-point of the balanced ±5V DC power supply to J16 (ground), fig 1, and switch on the power supply.
- Connect an oscilloscope to points ①, ②, ③ and ④, figs. 1 and 2.
- When the measured pulses are like the oscilloscope pictures ①, ②, ③ and ④, figs. 1 and 2, the switch mode power supply is in order.

Fig. 1

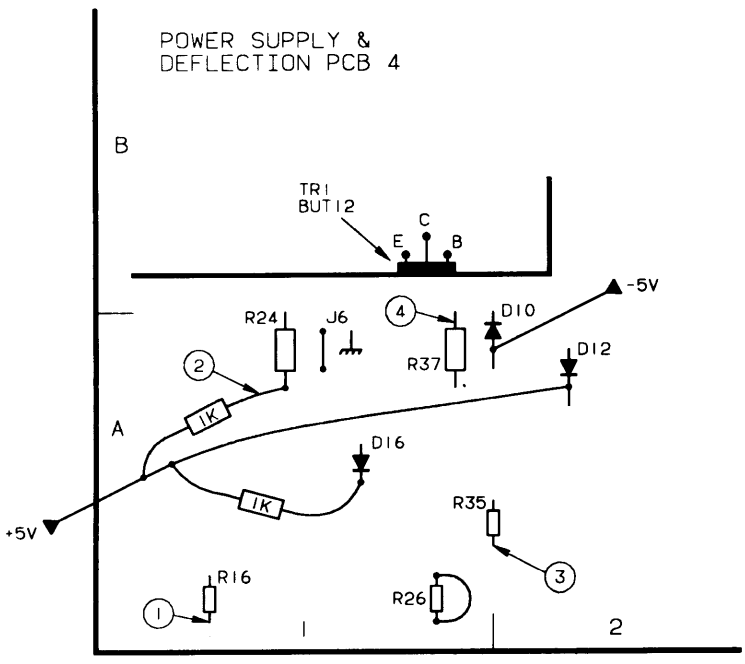
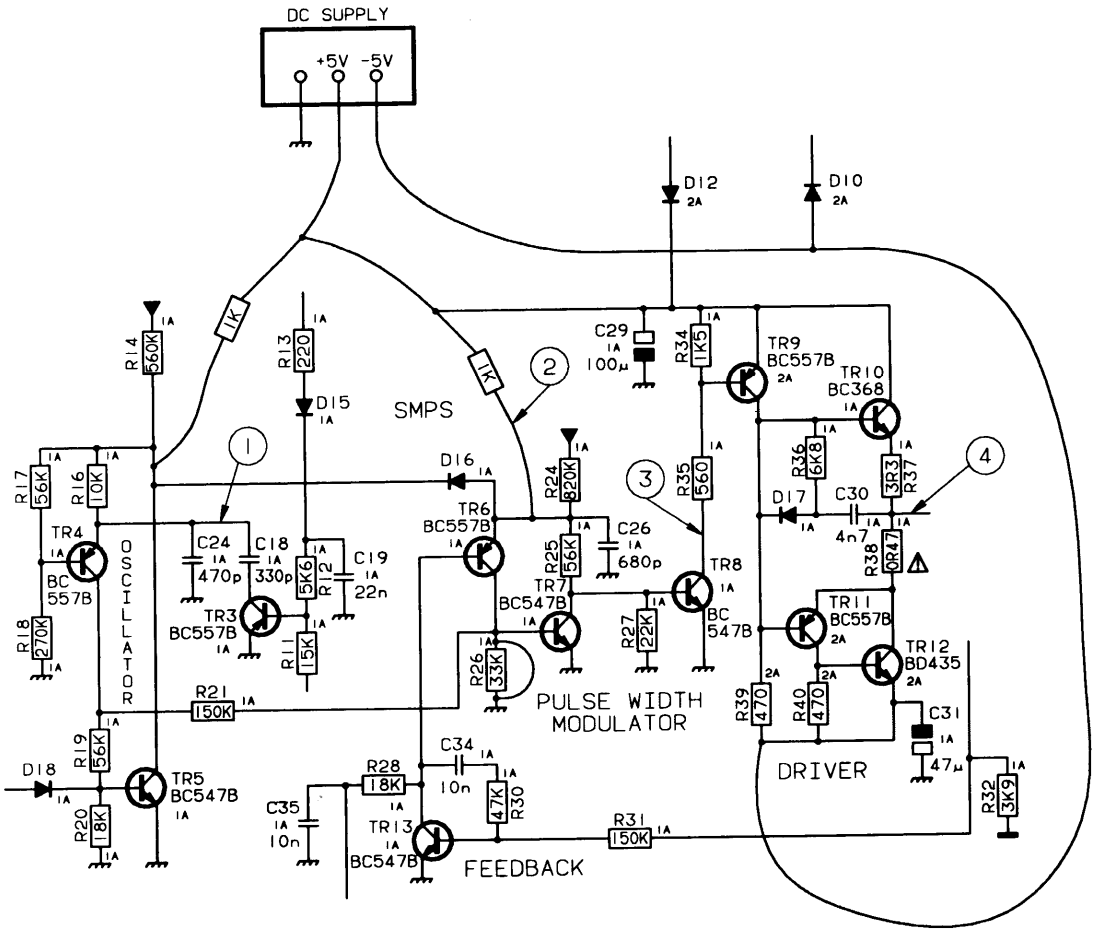
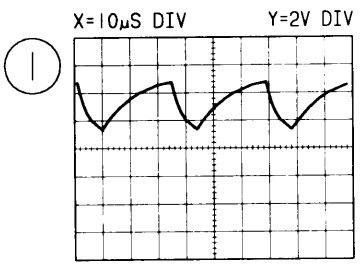
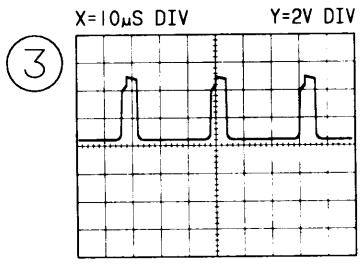
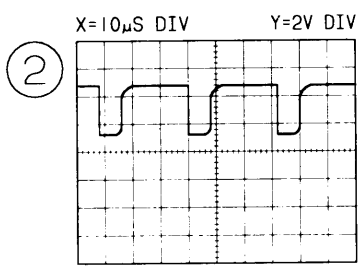


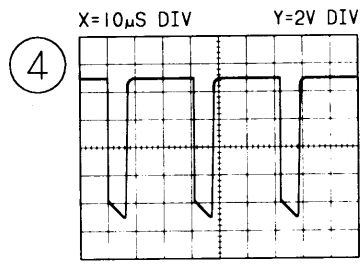
Fig. 2


DC SUPPLY
+5V -5V
D12
D10
SMPS
OSCILLATOR
PULSE WIDTH MODULATOR
DRIVER
FEEDBACK
TR4 BC 557B
TR3 BC557B
TR5 BC547B
TR6 BC557B
TR7 BC547B
TR8 BC 547B
TR9 BC557B
TR10 BC368
TR11 BC557B
TR12 BD435
TR13 BC547B
D15
D16
D17
D18
C29 100µ
C30 4n7
C24 470p
C18 330p
C19 22n
C26 680p
C31 47µ
C34 10n
C35 10n
R14 560K
R13 220
1K
R17 56K
R16 10K
R18 270K
R19 56K
R20 18K
R21 150K
R11 15K
R12 5K6
R24 820K
R25 56K
R26 33K
R27 22K
R28 18K
R30 47K
R31 150K
R34 1K5
R35 560
R36 6K8
R37 3R3
R38 0R47
R39 470
R40 470
R32 3K9


1
X=10µS DIV
Y=2V DIV


3
X=10µS DIV
Y=2V DIV


2
X=10µS DIV
Y=2V DIV

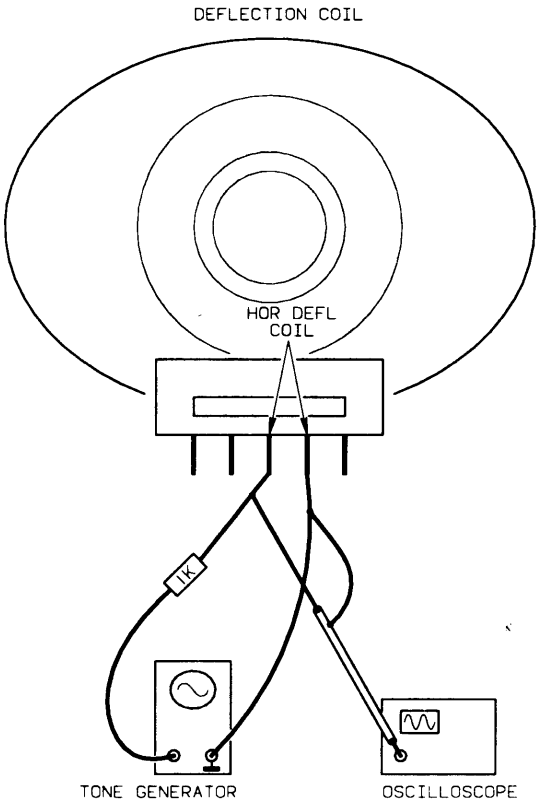

4
X=10µS DIV
Y=2V DIV

Retningslinier til fejlfinding i horisontal afbøjning

- TV'et må ikke være tilsluttet lysnettet.
- Tilslut en tonegenerator til den horisontale afbøjningsspole via en 1kohm modstand. Tonegeneratoren skal afgive et sinussignal på ca. 43kHz 100mV RMS.
- Tilslut et oscilloskop til den horisontale afbøjningsspole.

Guidelines for fault-finding in the horizontal deflection

- The TV set must not be connected to the mains.
- Connect a tone generator to the horizontal deflection coil via a 1 kohm resistor. The tone generator should produce a sine-wave signal of approx. 43 kHz, 100 mV, RMS.
- Connect an oscilloscope to the horizontal deflection coil.



- Kontroller at resonansfrekvensen er 43 ±2 kHz ved at ændre tonegeneratorens frekvens.
- Hvis der findes resonansfrekvenser i området 60kHz - 90kHz, kan fejlårsagen være følgende: EHT transformator 4T1 kortsluttet, horisontal afbøjningsspole kortsluttet eller 4C102 afbrudt.

Adskillelse af E/W kredsløbet og horisontal afbøjning

- Ved bredt og forvrænget billede: Afbryd forbindelsen fra 4L8 ben 1 til E/W udgangen (drain på 4TR35 og anoden på 4D77). Hvis billedet herefter bliver smalt og pudeforvrænget, er diode modulatoren ok.
- Ved smalt og forvrænget billede: Afbryd forbindelsen fra 4L8 ben 1 til E/W udgangen, og kortslut ben 1 på 4L8 til stel. Hvis billedet herefter bliver bredt og pudeforvrænget, er diode modulatoren ok.

- Check that the resonant frequency is 43 ±2 kHz by changing the frequency of the tone generator.
- If resonant frequencies within the 60 kHz - 90 kHz range are found, the reason for this fault may be one of the following: the EHT transformer 4T1 is short-circuited, the horizontal deflection coil is short-circuited or 4C102 is disconnected.

Separation of the E/W circuit and the horizontal deflection

- If the picture is wide and distorted: Disconnect the connection from 4L8 pin 1 to the E/W output (the drain of 4TR35 and the anode of 4D77). If the picture subsequently becomes narrow and has pincushion distortion, the diode modulator is OK.
- If the picture is narrow and distorted: Disconnect the connection from 4L8 pin 1 to the E/W circuit, and short-circuit pin 1 of 4L8 to ground. If the picture subsequently becomes wide and has pincushion distortion, the diode modulator is OK.

Automatisk Cut-Off

Det automatiske Cut-Off kredsløb udligner automatisk de forskelle, der i løbet af billedrørets levetid opstår mellem de tre elektronkanoners cut-off punkt.

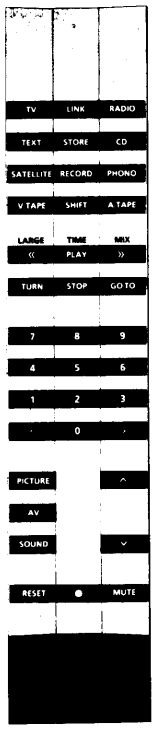
Den automatiske cut-off regulering sker i et samspil mellem 2/12IC4, nogle komponenter i videoudgangen og billedrøret (R, G og B feed-back signalerne).
Hvis en af de tre elektronkanoner kræver højere udstyring, vil DC niveauet i signalet på den tilhørende udgang (ben 1, 3 eller 5) af 2/12IC4 være stigende.

Automatic Cut-Off

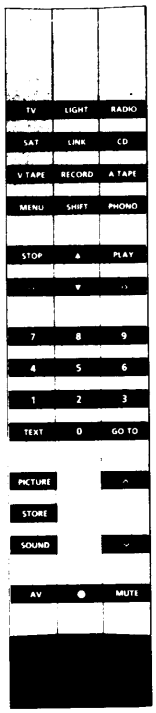
The automatic Cut-Off circuit automatically balances out the differences which occur among the cut-off points of the three electron guns during the life of the picture tube.

The automatic cut-off adjustment is achieved through the interaction of 2/12IC4, various components in the video output and the picture tube (the R, G and B feedback signals).
If one of the three electron guns requires higher driving, the DC level of the signal at the ancillary output (pins 1, 3 or 5) of 2/12IC4 will be increasing.

Beolink 1000 MK II



Beolink 1000 MK III



OPTIONS & SHIFT funktioner

OPTIONS

TV'et kan programmeres til flere forskellige options.

Option 0 = TV'ets IR modtager afbrydes.

Option 1 = Video- og audiosystem (Beolinksystem) placeret i samme rum.

Option 2 = Video- og audiosystem (Beolinksystem) placeret i forskellige rum.

Option 5 = Master (TV'et reagerer både på IR data koder og på AUX datalink koder).

Option 6 = Slave (TV'et reagerer kun på IR data koder).

Option 7 = Autokonfiguration. Hvis TV'et står i option 5 og kobles sammen med MCL 2AV, sættes TV'et automatisk i option 7 = option 6, slave. Hvis MCL 2 AV kobles fra TV'et, forbliver TV'et i option 6. Option 1 og 2 har ingen indflydelse på autokonfiguration.

Eksempel på programmering:
Tast [●] [PICTURE] [1] [STORE]
[PICTURE] [5] [STORE] = option 1 og 5.

Ved tryk på [STORE] blinker stand-by LED'en 1 gang, hvilket betyder at kommandoen er modtaget.

Option 1 og 2 skal altid kædes sammen med option 5 eller 6. TV'et er programmeret til option 1 og 5 fra fabrikken.

SHIFT funktioner

Tast: [GOTO] [SHIFT] [3] = Omskiftning mellem system BG og L.

Tast: [SHIFT] [7] = Non-Interlace.

Tast: [SHIFT] [9] = S-VHS indgangen er nu valgt.
Disse SHIFT funktioner er toggle funktioner.

SHIFT 2 funktionen:

Med SHIFT 2 funktionen kan TV'et låses på det valgte program, til optagelse på en videobåndoptager med envejs datakommunikation. Betjeningen er beskrevet på grundlag af Beolink 1000 MK III.

OPTIONS & SHIFT functions

OPTIONS

The TV can be programmed for several different options.

Option 0 = The IR receiver of the TV is disconnected.

Option 1 = Video and audio systems (Beolink system) placed in the same room.

Option 2 = Video and audio systems (Beolink system) placed in different rooms.

Option 5 = Master (the TV responds to both IR data codes and to AUX datalink codes).

Option 6 = Slave (the TV responds to IR data codes only).

Option 7 = Autoconfiguration. If the TV is set to option 5 and connected to an MCL 2AV, the TV is automatically set to option 7 = option 6, slave. If the MCL 2AV is disconnected from the TV, the TV will remain in option 6. Options 1 and 2 have no influence on autoconfiguration.

Programming example:
Press [●] [PICTURE] [1] [STORE]
[PICTURE] [5] [STORE] = options 1 and 5.

If [STORE] is pressed, the stand-by LED will flash once, indicating that the command has been received.

Options 1 and 2 always have to be linked with option 5 or 6. The TV has been programmed for options 1 and 5 at the factory.

SHIFT functions

Press: [GOTO] [SHIFT] [3] = Switching between system BG and system L.

Press: [SHIFT] [7] = Non-Interlace.

Press: [SHIFT] [9] = The S-VHS input has now been selected.
These SHIFT functions are toggle functions.

The SHIFT 2 function:

By means of the SHIFT 2 function the TV can be locked to the selected programme for recording on a video tape recorder with one-way data communication. The operating procedure has been described on the basis of a Beolink 1000 MK III.

1. En videobåndoptager tilsluttet:
   Vælg kilde, [TV] eller [SAT], tast nu [RECORD] [RECORD] [SHIFT] [2] TV'et er nu låst på det valgte program.
   For at låse signalvejen op igen, tast [TV] eller [SAT] [SHIFT] [2].

2. To videobåndoptagere (VTR1 og VTR2) tilsluttet:
   Signalvejen kan kun låses til en af videobåndoptagerne af gangen.

VTR1:
Vælg kilde, [TV] eller [SAT], tast nu [RECORD] [RECORD] [SHIFT] [2]. TV'et er nu låst på det valgte program til optagelse på VTR1.
For at låse signalvejen op igen, tast [V.TAPE] [TV] eller [SAT] [SHIFT] [2].

VTR2:
Vælg kilde, [TV] eller [SAT], tast nu [SHIFT] [RECORD] [SHIFT] [RECORD] [SHIFT] [2]. TV'et er nu låst til optagelse på VTR2.
For at låse signalvejen op igen, tast [SHIFT] [V.TAPE] [TV] eller [SAT] [SHIFT] [2].

1. One video tape recorder connected:
   Select the source, [TV] or [SAT], and then press [RECORD] [RECORD] [SHIFT] [2]. The TV is now locked to the selected programme.
   To unlock the signal path again, press [TV] or [SAT] [SHIFT] [2].

2. Two video tape recorders (VTR1 and VTR2) connected:
   The signal path can be locked to only one of the video tape recorders at a time.

VTR1:
Select the source, [TV] or [SAT], and then press [RECORD] [RECORD] [SHIFT] [2]. The TV is now locked to the selected programme for recording on VTR1.
To unlock the signal path again, press [V.TAPE] [TV] or [SAT] [SHIFT] [2].

VTR2:
Select the source, [TV] or [SAT], and then press [SHIFT] [RECORD] [SHIFT] [RECORD] [SHIFT] [2]. The TV is now locked to recording on VTR2.
To unlock the signal path again, press [SHIFT] [V.TAPE] [TV] or [SAT] [SHIFT] [2].

ISOLATIONSTEST

Ethvert apparat *skal* isolationstestes efter at det har været adskilt. Testen udføres når apparatet igen er helt samlet og klar til udlevering til kunden.

Isolationstesten udføres på følgende måde:

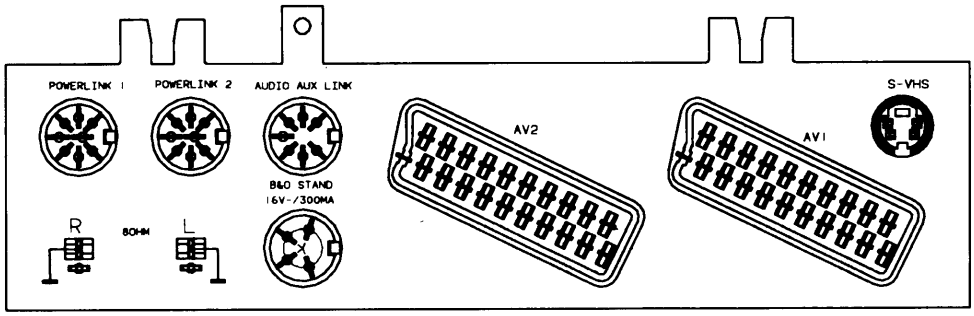
De to stikben på netstikket kortsluttes og tilsluttes en af terminalerne på isolationstesteren. Den anden terminal fra isolationstesteren tilsluttes stelbenet i en af højttalerstikdåserne.

INSULATION TEST

Each set *must* be insulation tested after it has been dismantled. The test is to be carried out when the set has been re-assembled and is ready for delivery to the customer.

The insulation test is carried out in the following way:

Short-circuit the two plug pins of the main plug and connect one of the terminals of the insulation tester. Connect the other terminal of the insulation tester to the chassis pin of one of the loudspeaker sockets.



OBS!
For at undgå beskadigelser på apparatet er det vigtigt, at begge terminaler fra isolationstesteren har virkelig god kontakt.

Der drejes nu langsomt med spændingsreguleringen på isolationstesteren indtil en spænding på 1,5-2 kV er opnået. Her skal den holdes i 1 sekund, derefter drejes der langsomt ned for spændingen igen.

Der må ikke på noget tidspunkt under testen forekomme overslag.

NOTE!
To avoid damaging the set, it is essential that both insulator test terminals are in really good contact.

Now turn slowly the voltage control down on the insulation tester until a voltage of 1.5-2 kV is obtained. Hold it there for 1 sec, then turn slowly the voltage down again.

Flashovers are not permitted during the testing procedure.

KREDSLØBSBESKRIVELSE

Denne kredsløbsbeskrivelse beskriver modul 4, netdel og afbøjning. En del af de resterende kredsløb er stort set identiske med L/LS/LX 4500/5500 og MX 3500/5500, type 39XX.

Det nye Chassis

Det nye TV-chassis omfatter to grundvarianter: en LX/MX-type og en LS-type.
Denne serviceanvisning omhandler udelukkende LX/MX-typen.
De beskrevne kredsløb er dog identiske i de to varianter.

Kredsløbsgennemgang

Power Supply & Deflection, modul 4, se detaildiagram I samt blokdiagrammer for Power Supply & Deflection.

Switch Mode Power Supply

SMPS'en i 35/42XX er en såkaldt »flyback converter«.
Den leverer en række forsyningsspændinger til drift af TV'et og sørger for galvanisk adskillelse mellem lysnettet og TV'ets elektriske kredsløb. Denne adskillelse ligger i T2 og optokoblerne IC1-3.

SMPS'en er pulsbreddemoduleret og kører under normal drift på en fast frekvens af ca. 32 kHz, som er låst til liniefrekvensen, for at undgå forstyrrelser i billedet.

SMPS'en leverer forsyningsspændinger under alle driftsforhold, således også i St.By. Her er driftsfrekvensen dog ca. 20 kHz, for at der kan trækkes lidt ekstra strøm fra skiftesystemet.

Alle styrekredsløb (oscillator, modulator, driver m.v.) er placeret på primærsiden, så SMPS'en selv kan starte op i St.by. Dermed undgås en separat St.by-forsyning, f.eks. med en 50 Hz transformator.

Opbygning

På primærsiden finder man styrings-/reguleringskredsløbet.
Oscillatoren består af TR4-5 samt den frekvensbestemmende komponent, C24 (C18).
Rampegeneratoren D16, C26 og R24.
Pulsbreddemodulatoren TR6-8 samt Driverkredsløbet TR9-12.

TR2, L1 og R4 er målekredsløb for overlastsikring.
Primærvikling 1-4 samt dioderne 9-12 giver en ca. ±5V forsyning til primærkredsløb, driver og optokoblere.
TR13 er reguleringstransistor for pulsbreddemodulatoren fra tilbagemeldingskredsløbet.
Snubberkredsløbet D5-7, L7 og C7-12 (-C9) begrænser spændingsspidser over TR1, når denne slukker.

CIRCUIT DESCRIPTION

This circuit description describes module 4, the power-supply unit and the deflection circuit. A number of the remaining circuits are largely identical with those in L/LS/LX 4500/5500 and MX 3500/5500, type 39XX.

The new chassis

The new TV chassis comprises two basic models: an LX/MX model and an LS model. These service instructions deal with the LX/MX model exclusively. However, the circuits described below are identical in the two models.

Circuit examination

Power Supply & Deflection, module 4, see detailed diagram I and the block diagrams for Power Supply & Deflection.

Switch Mode Power Supply

The SMPS in the 35/42XX is a so-called flyback converter. It outputs a number of supply voltages for the operation of the TV, and it ensures galvanic separation between the mains and the electrical circuits of the TV. This separation lies in T2 and the optocouplers IC1-3.

The SMPS is pulse-width modulated, and in ordinary operation it runs with a fixed frequency of approx. 32 kHz which is locked to the line frequency in order to avoid noise in the picture.

The SMPS outputs supply voltages under all operating conditions, also in stand-by. However, in stand-by the operating frequency is only approx. 20 kHz in order to permit a little extra current to be drawn from the switching system.

All control circuits (oscillator, modulator, driver, etc.) are placed on the primary side such that the SMPS is able to start up by itself in stand-by. A separate stand-by supply, e.g. as provided by a 50 Hz transformer, is thus not required.

Construction

The control/regulating circuit is located on the primary side. The oscillator consists of TR4-5 and the frequency determining component, C24 (C18).
The ramp generator D16, C26 and R24.
The pulse-width modulator, TR6-8, and the driver circuit, TR9-12.

TR2, L1 and R4 constitute the measuring circuit for the overload protection system. Primary winding 1-4 and the diodes 9-12 provide approx. ±5V supply for the primary circuit, driver and optocouplers.
TR13 is a regulating transistor for the pulse-width modulator from the feedback circuit.
The snubber circuit, D5-7, L7 and C7-12 (excluding C9), limits the voltage peaks across TR1, when this switches off.

Kontrol- og tilbagemeldingskredsløbet på sekundærsiden består af TR16-17 og dioderne D40-42 + D52.
Kredsløbet omkring TR18-20 fungerer som »on-off« switch styret af power failure pulser.
TR15 er St.by afbryder for forsyningsspænding til tuner og Beosat LM.

Optokobler IC1 overfører tilbagemeldingsinformation fra sekundært til primært kredsløb.
Optokobler IC2 overfører horisontal synkronisering til oscillatoren.
Optokobler IC3 overfører netfrekvensinformation (50 Hz) til mikroprocessorkredsløbet for synkronisering af TV'ets interne ur.

Princip

Pulser fra oscillatoren tilføres rampegeneratoren.
Denne opbygger en rampepuls på toppen af C26, pulsbreddemodulatoren.
Skifteniveauet (»Threshold value«) for pulsbreddemodulatoren er bestemt af spændingen fra feedback-regulatoren (TR13). Ved et bestemt niveau trækker modulatoren i TR8, samtidig aflades C26 af oscillatoren gennem D16.
Herefter startes forfra.
Derved opstår der pulser på kollektoren af TR8.
Disse forstærkes i driver-trinnet, som er koblet som en push-pull forstærker.
De forstærkede pulser sørger herefter for at trække skiftetransistoren, TR1 (BUT12), on og off.

Når TR1 leder, løber der en strøm fra 300V DC gennem primærviklingen (5-7) og TR1 til stel.
Derved oplades der energi i transformatoren. Når TR1 trækkes off, bliver den opladede energi i T2 overført til lytterne på sekundærsiden.

L2, R54 og C39 er et støjkompenseringsled, som udkompenserer den støjstrøm, der overspilles inde i transformatoren mellem dennes kapaciteter.
Y-kondensatorerne C5-6 indgår i denne støjkompensering.

R10 (10 Mohm) forhindrer evt. statisk opladning af TV'et til jord.

C5, C6 og R10 er sikkerhedskomponenter, som er placeret i henhold til myndighedskrav.

The monitoring and feedback circuit on the secondary side consists of TR16-17 and the diodes D40-42 + D52.
The circuit around TR18-20 operates as an on-off switch that is controlled by power failure pulses.
TR15 is the stand-by switch for the supply voltage to the tuner and Beosat LM.

Optocoupler IC1 transfers feedback information from the secondary to the primary circuit.
Optocoupler IC2 transfers horizontal synchronization to the oscillator.
Optocoupler IC3 transfers mains frequency information (50 Hz) to the microprocessor circuit for the synchronization of the internal clock of the TV.

Principle

Pulses from the oscillator are applied to the ramp generator. This generator builds up a ramp pulse at the top of C26, the pulse-width modulator. The threshold value for the pulse-width modulator is determined by the voltage from the feedback regulator (TR13). At a certain value, the modulator switches TR8 on and simultaneously C26 is discharged by the oscillator through D16. This cycle is then repeated.
Consequently, pulses occur at the collector of TR8.
These pulses are amplified in the driver stage, which is coupled as a push-pull amplifier.
The amplified pulses then make the switching transistor, TR1 (BUT12), go on and off.

When TR1 is conducting, a current from the 300V DC supply runs through the primary winding (5-7) and TR1 to ground. The transformer is thus charged with energy. When TR1 is pulled off, the energy charged in T2 is transferred to the lyts on the secondary side.

L2, R54 and C39 constitute a noise compensation circuit that obviates the noise current transferred between the capacitances inside the transformer.
The Y-capacitors, C5-6, are incorporated in this noise compensation system.

R10 (10 Mohm) prevents any static charging of the TV compared to ground.

C5, C6 and R10 are safety components which have been chosen in compliance with the requirements of the official authorities.

Beskyttelse

SMPS-oscillatoren synkroniseres i video mode af horisontale flybackpulser, som overføres af optokobleren IC2. De tilføres oscillatoren på basis af TR5 gennem D18. Derved resettes oscillatoren på hveranden puls, så den kører nøjagtig dobbelt liniefrekvens (31,25 kHz).
D18 sikrer, at støj ikke indstråles direkte i oscillatoren.
Oscillatoren forsynes fra 300V DC, men frekvensen er meget stabil overfor spændingsvariationer.

Push-pull drivertrinnet forsynes med ±5V for at sikre en effektiv styring af skiftetransistoren, TR1. R36, R38, C30 og D17 trækker en kontrolleret negativ basisstrøm ud af BUT12, når denne afbrydes, således at dette sker hurtigst muligt.

Det såkaldte snubber-kredsløb sidder parallelt med primærvikling 5-7 i kollektoren af TR1. Kredsløbet begrænser de kraftige spændingsspidser, der genereres over primærviklingen, når skiftetransistoren slukkes, for at den ikke skal blive ødelagt.
C12 overfører spidserne, som via D5-7 enten lægges til stel eller tilbage på forsyningen afhængig af polaritet.

Stelpunktet for den brokoblede ensretter D1-4 ligger på toppen af L1 og R4. Ved at måle spændingsfaldet over disse to komponenter fås således et udtryk for strømmen i primærviklingen af T2.
TR2 måler via R7 dette spændingsfald. Ved for kraftig primærstrøm trækkes emitteren lav, TR2 begynder at lede, og der trækkes i feedback-regulatoren. Derved begrænses bredden af styrepulserne, og belastningen falder.
Denne overbelastningsbeskyttelse skal forhindre strømmene i at løbe løbsk ved opstart samt ved evt. kortslutning af en af udgangene, igen for af beskytte BUT12 (TR1).

Opstart

Når TV'et tilsluttes netspænding, skal SMPS'en selv starte op og levere 8V St.By spænding.
De fleste kredsløb på primærsiden er forsynet af 300V DC, som straks er til stede.
Samtidig ledes netspænding via R45 og IC3/R44 til C32. Herfra lades der på C29 (100µF) via R43.
Endvidere bliver den 50 Hz brum, der ligger over C32 (1µF), ført via R29 til feedback-regulatoren. Det bevirker, at opstartsforsøg kommer i små klumper af 50 Hz.
Dermed lettes opstarten til St.By, så den er mulig allerede ved en netspænding på ca. 120V.

Protection

The SMPS oscillator is synchronized in video mode by horizontal flyback pulses which are transferred by the optocoupler, IC2. These pulses are applied to the oscillator at the base of TR5 through D18. Consequently, the oscillator is reset with every second pulse such that it runs at exactly twice the line frequency (31.25 kHz).
D18 prevents direct noise pick-up by the oscillator.
The oscillator receives its power from the 300V DC power supply.
However, the frequency is very stable towards voltage fluctuations.

The push-pull driver stage receives a ±5V power supply in order to ensure efficient control of the switching transistor, TR1. R36, R38, C30 and D17 draw a controlled negative base current from BUT 12 when the latter is disconnected such that it takes place as quickly as possible.

The so-called snubber circuit is parallel to the primary winding 5-7 in the collector of TR1. This circuit limits the strong voltage peaks generated across the primary winding when the switching transistor is switched off, thereby preventing the transistor from being destroyed. C12 transfers the peaks, and via D5-7 they are either connected to ground or fed back to the supply, depending on the polarity.

The ground level of the bridge-coupled rectifier, D1-4, is at the top of L1 and R4. A measurement of the voltage drop across these two components thus gives an expression of the current in the primary winding of T2. TR2 measures this voltage drop via R7. If the primary current is excessive, the emitter is pulled low, TR2 starts conducting, and the feedback regulator is activated. This limits the width of the control pulses, and the load drops.
This overload protection serves to prevent the currents from running wild at power-up and in the event of a short-circuit in one of the outputs, still in order to protect BUT12 (TR1).

Power-up

When the TV is connected to the mains voltage, the SMPS has to start up by itself and supply 8V stand-by voltage.
Most circuits on the primary side receive the 300V DC supply which is available immediately.
Mains voltage is applied at the same time to C32 via R45 and IC3/R44. C32 charges C29 (100µF) via R43. Furthermore, the 50 Hz hum across C32 (1µF) is fed through R29 to the feedback regulator. This has the effect that power-up attempts come in small lumps of 50 Hz each.
This facilitates the power-up procedure to stand-by such that it is enabled even at a mains voltage of approx. 120V.

Stand By drift

Under St.by er power failure bussen 0V (ingen pulser).
Dermed er »on-off« kredsløbet TR18-19 ikke aktiveret, og TR20 leder.
Spændingsspidser fra sekundærvikling 11-13 ledes via R58 og C50 til D37, som clamper de negative spidser til St.by forsyningen.
Ved midling i R76 skaber de positive spændingsspidser således en gate-forspænding før R78 på ca. 19V.
D50 sikrer, at spændingen ikke stiger og dermed skader FET'en.
Når TR20 leder, er sekundærvikling 20 før D31 lagt til St.by forsyningen (Drain-Source). Derved er det hovedviklingen fra T2, som genererer 8V forsyningsspænding.

Tilbagemelding og stabilisering sker ved, at St.by forsyningen ledes via R79, D52 og D41 til IC1 – feedback-optokobler.
Derved tvinges pulsbreddemodulatoren til at lave så smalle pulser, at SMPS'en kun leverer ca. 8V på hovedviklingen.

I audio/video mode leverer primærvikling 4 på T2 positiv basisspænding via D15 til TR3, hvorved denne er spærret.
I St.by er spændingen fra vikling 4 for lav, og -5V får gennem R11 TR3 til at lede. Derved parallelkobles C18 med C24, således at oscillatorfrekvensen falder fra 32kHz til ca. 20kHz.
Den lavere frekvens giver mulighed for at trække en lidt højere St.by strøm (ca. 0,4 A).
Gennem TR15 (emitter-kollektor) leveres i A/V-mode 154V til tuningsspænding og til Beosat LM. I St.by falder spændingen på emitteren til ca. 8V identisk med basis. Herved spærrer TR15 for forsyningen til de omtalte kredsløb i St.by.

Video mode drift

Ved opstart til video mode leverer mikroprocessoren power failure pulser.
Disse pulser ledes via C62 og R84 til basis af TR19, som således skifter on/off med samme frekvens som power failure pulserne. Herved startes en opladning af C61. Efter kort tid overstiger spændingen på TR18 basis ca. 0,7V, og denne går on og trækker dermed TR20 gate lav. TR20 går off, og St.by spændingen bliver afbrudt.
Nu begynder St.by spændingen at falde, og det registreres naturligvis gennem feedback-kredsløbet.
TR13 kollektor stiger, hvorved pulsbreddemodulatoren genererer bredere pulser.
Det bevirker, at udgangsspændingerne fra sekundærsiden af T2 begynder at stige. Da TR20 er afbrudt fortsætter denne stigning indtil alle driftsspændinger er på plads.
D.v.s. 154V fra hovedviklingen og 8V fra St.by viklingen m.v. St.by viklingen (13) overtager nu selv St.by forsyningen gennem D35.

Stand-by operation

During stand-by, the power failure bus has 0V (no pulses). Consequently, the on-off circuit, TR18-19, is not activated, and TR20 is conducting.
Voltage peaks from secondary winding 11-13 are fed through R58 and C50 to D37 which clamps the negative peaks to the stand-by supply. Through averaging in R76, the positive voltage peaks thus generate a gate bias before R78 of approx. 19V.
D50 ensures that the voltage does not increase, thereby damaging the FET. When TR20 is conducting, secondary winding 20 before D31 is connected to the stand-by supply (Drain-Source). Consequently, it is the main winding from T2 that generates the 8V supply voltage.

Feedback and stabilization is achieved by feeding the stand-by supply through R79, D52 and D41 to IC1, the feedback optocoupler. This forces the pulse-width modulator to generate pulses which are so narrow that the SMPS supplies only approx. 8V to the main winding.

In audio/video mode, primary winding 4 on T2 supplies positive base voltage through D15 to TR3, causing the latter to be blocked.
In stand-by, the voltage from winding 4 is too low, and through R11 the -5V supply makes TR3 conduct. C18 and C24 are thereby connected in parallel such that the oscillator frequency drops from 32 kHz to approx. 20 kHz. The lower frequency permits a slightly higher stand-by current to be drawn (approx. 0.4 A).
154V is supplied through TR15 (emitter-collector) as tuning voltage and to Beosat LM in A/V mode. In stand-by, the voltage at the emitter drops to approx. 8V, which is identical with the base voltage. This makes TR15 block the supply to the above-mentioned circuits in stand-by.

Video mode operation

If the TV is set to go into video mode at power-up, the microprocessor will generate power failure pulses. These pulses are fed through C62 and R84 to the base of TR19, which will thus switch on/off at a frequency identical with that of the power failure pulses. This initiates the charging of C61. After a short period of time, the voltage at the base of TR18 exceeds approx. 0.7V, causing it to go on and thereby pulling the TR20 gate low. TR20 goes off, and the stand-by voltage is disconnected.
The stand-by voltage now begins to drop, and this is monitored through the feedback circuit, of course. The collector of TR13 increases, causing the pulse-width modulator to generate wider pulses. Consequently, the output voltages from the secondary side of T2 begin to increase. Since TR20 is disconnected, this increase will continue until all operating voltages have been adjusted to their proper values, i.e. 154V from the main winding and 8V from the stand-by winding, etc. The stand-by winding (13) now takes over the stand-by supply through D35 itself.

I video mode er 154V den stabiliserende spænding. Spændingsdeleren R70-72 føler på 154V og leverer basisstrøm til TR17.
TR16-17 udgør sammen en strømgenerator, som styrer strømmen i optokobleren IC1. Reference for styrespændingen fra 154V er D42, 6,2V zenerdiode. Forsyningsspænding til strømgeneratoren er delvis genereret af 15V og delvis 13VTV, som leveres fra T1, horisontal transformator via D40.

Audio mode drift

I audio mode fungerer SMPS'en på samme måde som i video mode, dog benyttes 15V som den stabiliserende spænding, da 154V stort set er ubelastet.

I audio mode er afbøjningskredsløbet slukket, derfor mangler 13VTV. I stedet benyttes alene 15V som forsyningsspænding til strømgeneratoren, TR16-17. Spændingsdeleren R64 og R68 bevirker dog at forsyningsspændingen falder fra 8,3V til 7V. Samtidig stiger »154V« forsyningen i audio mode til mellem 170-200V, p.g.a. manglende belastning.
Da basisforspændingen til TR17 stiger, går denne i mætning og kollektorspændingen bliver lig med zenerspændingen fra D42, 6,2V.
Dermed bliver TR16 reguleringstransistor og reagerer udelukkende på spændingsvariationer på emitteren, dvs. fra 15V forsyningen.

TV Off

Når TV'et slukkes, fjernes power failure pulserne af mikroprocessoren. Dette kan naturligvis også forårsages af en fejl, som belaster power failure bussen, deraf formålet med denne (se Power Failure diagram).

Når pulserne forsvinder, går TR19 off, og C61 aflades gennem R81, R82 og R85, hvorved TR18 ligeledes går off. Nu stiger gatespændingen på TR20, som derved går on. Det bevirker, at hovedforsyningsviklingen bliver lagt på 8V St.by kondensatoren, C52 (2200µF). Transformatorspændingen falder således øjeblikkeligt til 8V, og tilbagemeldingen gennem D52 og D41 sikrer, at spændingen forbliver 8V, indtil TR20 igen går off. Spændingen på C42 falder ligeledes i løbet af nogle få sekunder fra 154V til ca. 8V.

Degauss

Afmagnetiseringsspolen og PTC'en (R2) sidder i serie med triac'en (ST1) direkte til netspændingen. Når TV'et tændes, resulterer energiforøgelsen i T2 i en spænding fra primærvikling 9-10. Denne spænding ledes via R6, ensrettes af D8 og oplades på C14, hvorefter ST1 går on.
Således afmagnetiseres billedrøret, hver gang TV'et tændes.

In video mode, 154V is the stabilizing voltage. The voltage divider, R70-72, scans the 154V and supplies base current to TR17.
TR16 and TR17 collectively constitute a current generator that controls the current in the opto-coupler, IC1. The reference for the control voltage from the 154V supply is D42, a 6.2V Zener diode. The supply voltage to the current generator is generated partly by 15V and partly 13VTV which is supplied by T1, a high voltage transformer via D40.

Audio mode operation

The SMPS operates in the same way in audio mode as it does in video mode, only 15V is used as the stabilizing voltage, because 154V is largely unloaded.

The deflection circuit is switched off in audio mode, and 13VTV is consequently missing. 15V is used only as the supply voltage to the current generator, TR16-17.
However, the voltage divider, R64 and R68, has the effect that the supply voltage drops from 8.3V to 7V. The 154V supply increases to 170-200V in audio mode at the same time, because of the missing load.
Since the base bias applied to TR17 increases, TR17 goes into saturation and the collector voltage becomes equal to the Zener voltage from D42, i.e. 6.2V.
Consequently, TR16 becomes a regulating transistor, and it reacts to voltage variations at the emitter exclusively, i.e. from the 15V supply.

TV off

When the TV is switched off, the power failure pulses are removed by the microprocessor. Of course, this may also be caused by an error that loads the power failure bus, hence the objective of having it installed (see the Power Failure diagram).

When the pulses disappear, TR19 goes off and C61 is discharged through R81, R82 and R85, causing TR18 to go off as well. The gate voltage at TR20 will now increase, and it will go on. This has the effect that the main supply winding is connected to the 8V stand-by capacitor, C52 (2200µF). The transformer voltage will thus drop to 8V immediately, and the feedback through D52 and D41 ensures that the voltage remains at 8V until TR20 goes off again. The voltage across C42 also drops from 154V to approx. 8V within a few seconds.

Degauss

The degaussing coil and the PTC (R2) are connected in series with the triac (ST1), receiving a direct mains voltage supply. When the TV is switched on, the increase in energy in T2 results in a voltage from primary winding 9-10. This voltage is fed through R6, rectified by D8 and charged at C14, causing ST1 to go on. Thus the picture tube is then degaussed every time the TV is switched on.

Deflection

Modul 13, Sync. Processing, genererer alle nødvendige afbøjningssignaler som ledes til forstærkerkredsløbene på modul 4 (Power Supply & Deflection).

Afbøjningsudgangene kan deles op i tre:

- Horisontal Drive
- Vertical Drive
- East/West Drive

Horisontal Udgang

Horisontalkredsløbet sørger for horisontal afbøjning. Endvidere genererer horisontaltransformatoren en række spændinger:

- Højspænding 27,5kV
- Fokusspænding
- Glødespænding 6,3V
- 13VTV
- 7VTV
- ±11V til vertikal udgang, IC4

og desuden

- Horisontale flyback-pulser
- Strålestrømsinformation

Horisontal Drive består af en drivertransistor og en drivertransformator TR31 og T4, samt udgangstransistoren TR33.
Kredsløbet forsynes fra 154V gennem horisontaltransformatorens primærvikling, ben 2/10, hvorved energi genereres i horisontal transformatoren, når afbøjningen kører.

Horisontaltransformatoren er konstrueret, så den afgiver meget præcise spændinger.
Derved har det kunnet undgås at montere en seriemodstand for glødespændingen. Det betyder, at forskellige typer billedrør kan benyttes, uden at en sådan modstand skal ændres. Desuden tabes mindre energi i form af varme.

Endvidere findes der ingen sikringsmodstande på forsyningerne +7VTV og +13VTV.
I stedet er der monteret et beskyttelseskredsløb, i form af IC5.
Strømmen i horisontalkredsløbet går til stel gennem R127 (0,22 ohm). Spændingen på toppen af R127 føles gennem R125, og ledes til -indgangen af operationsforstærkeren IC5, ben 2.
+indgangen, ben 3, ligger på en fast referencespænding i form af spændingsdeleren R122/R123 (1% modstande).

Hvis strømmen gennem R127 overstiger et vist niveau (f.eks. ved en kortslutning af en transformatorudgang), så overstiger spændingen på -indgangen af IC5 +indgangen.

Deflection circuit

Module 13, Sync Processing, generates all the necessary deflection signals which are fed to the amplifier circuits on module 4 (Power Supply & Deflection).

The deflection outputs may be divided into three circuits:

- Horizontal Drive
- Vertical Drive
- East/West Drive

Horizontal drive

The horizontal circuit provides horizontal deflection. Furthermore, the horizontal transformer generates a number of voltages:

- High voltage, 27.5kV
- Focusing voltage
- Filament voltage 6.3V
- 13VTV
- 7VTV
- ±11V to vertical output, IC4

as well as

- Horizontal flyback pulses
- Beam current information

Horizontal Drive consists of a driver transistor and a driver transformer, TR31 and T4, as well as the output transistor, TR33.
The circuit is supplied by the 154V power supply through the primary winding of the horizontal transformer, pin 2/10, and energy is thus generated in the horizontal transformer when the deflection circuit is in operation.

The horizontal transformer has been designed to output very accurate voltages.
Installation of a series resistor for the filament voltage has thus not been necessary. This means that different types of picture tube may be used without changing the specifications of such a resistor. Besides, less energy is lost in the form of heat.

Furthermore, the +7VTV and +13VTV power supplies do not have any fuse resistors.
A protective circuit in the form of IC5 has been installed instead.
The current in the horizontal circuit runs to ground through R127 (0.22 ohm). The voltage at the top of R127 is monitored through R125 and fed to the negative input of the operational amplifier, IC5, pin 2. The positive input, pin 3, has a fixed reference voltage in the form of the voltage divider, R122/R123 (1% resistors).

If the current through R127 exceeds a certain level (e.g. in the event of a transformer output short-circuit), the voltage at the negative input of IC5 will exceed that at its positive input.

Differencen betyder at operationsforstærkeren trækker i Power Failure bussen via R126 og D75. Derved går TV'et i St.By.
C73 sørger for, at kun middelforbruget fra transformatoren registreres.

For at sikkerhedskredsløbet ikke skal reagere på et kraftigt strålestrømsforbrug fra transformatoren, er D78 og R124 indført.
Disse føler på strålestrømmen gennem bunden af højspændingsviklingen, ben 4.
Ved stigende strålestrøm falder spændingen på D78, og derved trækkes negativt i spændingen til sikkerhedskredsløbet, som derved udkompenseres for ændringer i strålestrømmen.

1 Gohms modstand internt i horisontaltransformatoren aflader billedrøret når TV'et slukkes. Afladningen sker gennem fokuspotentiometeret til stel. Herved undgås en lysende prik på skærmen, når TV'et slukkes.

Svingningskredsen, L8/C81, har til opgave at »flytte« en parasitresonans inde i transformatoren, for at opnå en bedre og mere flad højspændingskarakteristik.

Vertikal Udgang
Vertical drive består af IC4, som forstærker savtandspulserne fra Sync. Processing og trækker vertikal afbøjning.
IC4 forsynes af ±11V fra horisontaltransformatoren. Endvidere leverer IC4 vertikale flyback-pulser fra ben 3 til bl.a. vertikal sikkerhedskredsløb i sync. processoren (IC1) på modul 13.
Det sker for at undgå ødelæggelse af billedrøret ved fejl i vertikal afbøjning (vandret streg).

Øst/Vest Udgang
E/W drive kredsløbet er i teorien opbygget som en SMPS.
I dette tilfælde dog en SMPS der ikke afgiver effekt men derimod optager effekt fra diodemodulatoren. Denne effekt (ca. 1,5W) ledes via D77 tilbage til forsyningen, 154V.

På udgangen af kredsløbet (TR35, Drain) ses ikke et parabelformet signal, men et firkantsignal (0V - 150V).
Da signalet passerer en spole (L8) inden diodemodulatoren, bliver kun middelværdien videreført, nemlig svarende til en parabel.

C90 har to opgaver:
- at lave firkantpulser fra udgangen om til en parabel i tilbagekoblingen
- at være bestemmende for sløjfeforstærkningen i kredsløbet.

The difference makes the operational amplifier pull the Power Failure bus low via R126 and D75. As a consequence, the TV goes into stand-by. C73 ensures that only the mean consumption from the transformer is registered.

D78 and R124 have been installed to prevent the protective circuit from reacting to a heavy beam current consumption from the transformer. These two components monitor the beam current through the base of the high-voltage winding, pin 4.
When the beam current increases, the voltage at D78 drops. This makes the voltage to the protective circuit go in negative direction, thereby obviating changes in the beam current.

A 1 Gohm resistor internally in the horizontal transformer discharges the picture tube when the TV is switched off. This discharge is effected through the focusing potentiometer to ground. In this way a light dot on the screen is avoided when the TV is switched off.

The task of the oscillatory circuit, L8/C81, is to "move" a parasitic resonance inside the transformer in order to achieve a better and flatter high-voltage characteristic.

Vertical Drive
The vertical drive consists of IC4 which amplifies the sawtooth pulses from Sync. Processing and drives the vertical deflection.
IC4 is supplied by the ±11V power supply from the horizontal transformer. Furthermore, IC4 outputs vertical flyback pulses at pin 3 a.o. to the vertical protective circuit in the sync. processor (IC1) on module 13. This is done in order to avoid that the picture tube is destroyed by errors in the vertical deflection (horizontal line).

East/West Drive
In theory, the E/W drive circuit is designed like an SMPS. In this case, however, an SMPS that does not supply power but rather draws power from the diode modulator.
This power (approx. 1.5W) is fed back to the 154V power supply via D77.

The output of the circuit (TR35, Drain) is not a parabolic signal but rather a square-wave signal (0V - 150V).
Since the signal passes a coil (L8) before the diode modulator, only the mean value is propagated, and this signal corresponds to a parabola.

C90 serves a dual objective:
- converting square-wave pulses from the output into a parabola in the feedback
- determining the loop amplification in the circuit.

Operationsforstærkeren (IC5) tilføres et parabelformet drive-signal på +indgangen, ben 5. Modkobling fra udgangen af kredsløbet via R112 ledes til -indgangen, ben 6.

Der står nu et parabellignende signal på udgangen af operationsforstærkeren, IC5 ben 7. Det ser en anelse forvrænget ud, da det samtidig indeholder en lille savtand på ca. 1Vss. Denne savtand påstår ved integration af udgangssignalet i RC-leddet R112/C90.
Spændingen på IC5, ben 7, fungerer nu som en »DC«, der bestemmer, hvor brede pulser kredsløbet skal levere.
Jo højere spænding på ben 7 des bredere pulser fra TR35.
De bredeste pulser, der kan leveres, er dog af samme bredde som horisontale flyback-pulser.

Positive flyback-pulser fra horisontaltransformatoren, vikling 1 (glødespænding), ledes via R117 til knudepunktet mellem R116 og D76.
Der opstår således en flyback-puls med variabelt DC-indhold på katoden af D76. DC-indholdet varieres fra operationsforstærkeren, IC5.

Den positive del af flyback-pulsen afbryder D76. Så oplades C91 via R119 fra 13VTV. Det betyder, at der kommer til at stå en rampespænding på C91. Denne rampe tænder og slukker TR34.

Spændingen fra IC5, ben 7 bestemmer rampens højde og dermed ledetiden for TR34.
Derved opstår der firkantpulser på udgangen af FET-transistoren, TR35, med varierende bredde.

Systemet er samtidig linielåst p.g.a. styringen med horisontale flyback-pulser fra glødeviklingen.

Ved at ændre på parabelsignalet til IC5, ben 5, kan Ø/V-korrektionen bestemmes.

A parabolic drive signal is applied to the positive input, pin 5, of the operational amplifier (IC5). Negative feedback from the output of the circuit is fed to the negative input, pin 6, via R112.

The signal at the operational amplifier output, IC5, pin 7, now has a shape similar to a parabola. It appears to be slightly distorted, because it also contains a small sawtooth of approx. 1Vss. This sawtooth remains when the output signal is integrated in the RC section, R112/C90.
The voltage at IC5, pin 7, is now operating as a "DC" that determines the width of the pulses supplied by the circuit.
The higher the voltage at pin 7, the wider the pulses from TR35. However, the widest pulses that may be generated are of the same width as horizontal flyback pulses.

Positive flyback pulses from the horizontal transformer, winding 1 (filament voltage), are fed through R117 to the junction between R116 and D76.
Consequently, a flyback pulse with a variable DC content occurs at the cathode of D76. The DC content is varied by the operational amplifier, IC5.

The positive portion of the flyback pulse disconnects D76. C91 is then charged by 13VTV via R119. This means that there will be a ramp voltage at C91. This ramp switches TR34 on and off.

The voltage from IC5, pin 7, determines the height of the ramp and thus the "On" period of TR34. Consequently, square-wave pulses of varying width occur at the output of the FET transistor, TR35.

At the same time, the system is line locked because of the control exercised by the horizontal flyback pulses from the filament.

The E/W correction may be determined by changing the parabolic signal applied to IC5, pin 5.